Stronger together: Holistic learning through Education for Sustainability.

A thesis submitted in partial fulfilment of the
requirements for the degree of

Master of Education

by

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WAIKATO
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August 2018

Abstract

Students in New Zealand secondary schools are more stressed and anxious about assessments than any other nation in the Organisation for Economic Co-operation and Development (OECD). There is also low engagement and enjoyment in learning leading to negative repercussions on behaviour, health and achievement. In previous studies, Education for Sustainability (EfS) has shown strong potential as an engaging and enjoyable education system, in ways that align with the values of the New Zealand Curriculum. It is possible that EfS could also have potential to reduce stress in secondary assessment and yet engage students to achieve.

This piece of action research explored the student experience of learning through EfS using a theoretical framework drawn from Outdoor Learning, Place Responsive Education and Issues Based Education. The framework puts emphasis on student wellbeing, embedding confidence in students, engaging students in democracy and providing avenues for them to participate within their culture, society, environment and economy in a positive way.

The framework was manifest in an intervention: a 10-day 'Sustainability camp' in the context of a local mining issue within the Kaimai-Mamaku Forest Park, New Zealand. On the camp were 13 Year 10 students (14-15 years old) and three teachers. An interpretive methodology was engaged to explore the student experiences and outcomes of the camp. The forms of data collection used were: pre-post questionnaires, a post focus group interview and participant observations. Data analysis consisted of collating, averaging and graphing data from the questionnaire and coding data from focus group interviews and observations into seven categories (Sustainability values, Sustainability intentions, Knowledge, Connection to place, Social connections, Engagement & Enjoyment of learning).

Findings indicated that the intervention resulted in a stress free, enjoyable and engaging learning experience for students. An ethic of care for the area was indicated by many students, as was a connection to the place itself. Strong friendships were cultivated due to the breaking down of social barriers and the communal nature of camp living. Student knowledge of the context increased and achievement was retained at a high level. Sustainability literacy increased in a number of areas and there was a marginal increase in action competence indicators.

A worrying finding was that students commented on their low confidence in democracy within society. Ways to improve the student experience, student achievement, sustainability literacy and action competence via modifications to the intervention are put forth for the consideration of EfS practitioners.

Acknowledgements

I could not possibly have completed this thesis without the support of my friends, family, colleagues and academic staff at the University of Waikato. In particular, I would like to thank anyone that I ever harassed to proof read an assignment for me and anyone that had to put up with my erratic study habits.

A huge thank you to all the students that participated in this study – it was great getting to know you all better, I won't forget the great time we had. A massive thank you to Greg and Elise for giving up a significant amount your time to come on camp, you are great people and the students were lucky to have you. Thanks Rose for being supportive of my study leave and marking the students' assignments – you are one of the good ones.

Thank you Ra for letting me stay in your cabin in the woods for four months while I disciplined myself to write this thesis – you are a champ. Thanks Ness for all your support, feeding me and getting me out of the cabin, I'm lucky to have such a good sister. Thanks Bodhi for being a welcome distraction, hanging out with you and picking blackberries in the summer was pretty special.

A big thank you to the ocean for keeping me sane by providing glorious surf. Thanks Ma and Pa for your support and providing a roof over my head when cabin life got too much. Gracias to Morten, Memo, Asbjorn & Georgie for your generous hospitality in letting me stay in Copenhagen while I applied the finishing touches - legends.

Lastly, a big thank you to Chris Eames, your guidance, support and feedback made this whole project possible.

Table of Contents

List of figures

Table of acronyms

PRE	Place Responsive Education
EfS	Education for Sustainability
EE	Environmental Education
IBE	Issues Based Education
ZPD	Zone of Proximal Development
NZ	New Zealand (country)
NZC	New Zealand Curriculum
NCEA	National Certificate for Educational Achievement
UNESCO	United Nations Educational Scientific and Cultural organisation

1. Introduction

1.1 Chapter Overview

This chapter is an introduction to my thesis. Within it I discuss my motivation for carrying out the study and a justification for it. I discuss the purpose of the research into a sustainability intervention that I undertook with 13 students in the summer of 2017 and the questions I sought to explore. I also outline the significance of the research, potential limitations and finish by describing the structure of the rest of the thesis.

1.2 Motivation for the research

I grew up in Mount Maunganui, New Zealand - in a middle class family that valued the outdoor environment. We were always outside. I surfed, snorkeled, kayaked and hiked around the Bay of Plenty in my spare time. I was so into the ocean that I decided I'd like to be a Marine Biologist – so that I could save the oceans from pollution and overfishing. I decided to study Ecology and Zoology at the University of Otago. I was impressed by the variety of wildlife there and began volunteering with the Department of Conservation – learning a lot of practical skills in environmental restoration. Towards the end of my studies I was a lot more into ecology than zoology – I realized I was naturally more of a big picture thinker.

At 21 years of age my passions were ecology and the outdoors. Subsequently, I spent the next 4 years working in eco-tourism as a wildlife/outdoor pursuits guide. I worked/lived in California, Hawaii, Australia and Nicaragua. At the time I volunteered for several environmental non-profit agencies and worked with some really passionate people. I noticed that most of the non-profit organizations struggled for funding and getting the active support of the public. Eventually I grew tired of eco-tourism – the main drive behind all the companies I worked for was to turn a profit and my efforts to make the businesses more sustainable fell on deaf ears. Because it would cost money! I was frustrated and contemplated starting my own business. I wanted to do something meaningful with my life and I felt as though I was in the wrong profession.

I thought to myself – the only way to change the way that people value the environment is to get to them when they're young. Get them to value and to love the environment and things will change. I believe that changing mindsets is the

most important thing we can do for the environment. That is why I trained as an educator and why I currently work as a Science/Biology teacher. Over the last few years I have expended a lot of time and energy learning how to teach, how the education system works, how the National Certificate of Educational Achievement (NCEA) works, how students work. I began my Masters in Education because I felt as though I knew the system well enough to change it for the better. I had it in my mind that I wanted to get students to care more about the environment, so I chose to take 2 papers that shaped my thinking around the topic of my thesis: Outdoor Education and Education for Sustainability. Along the way I learnt about how a positive relationship with the environment is formed within an individual and just how complex that process is. I decided to focus my thesis on applying the principles that I had learnt at University to my own teaching practice. To develop a better way for students to learn that focusses on increasing their sustainability literacy and action competence whilst retaining knowledge, high achievement and enjoyment in learning. The best of both worlds.

1.3 Justification for the research

As a secondary teacher at a Decile 6 public school in New Zealand for six years, I have personally seen the boredom, disconnection and unsustainable behavior and practices amongst the student population and the school system at large. These observations and subsequent research made me think: These students have been placed in a room with 25+ other immature humans and are expected to behave responsibly when under the tenuous leadership of one adult. That is a lot to expect from that one adult (and those 25 students) without even taking into account that there is learning to be done as well. Students are expected to learn abstract concepts, develop empathy for each other and for contexts that they cannot see, may never have encountered and may never encounter in their lifetimes. We are asking a lot of them (and of the teacher). If we know that other forms of education are more suitable for engaging students in learning and fostering individuals that care for their place (in the holistic sense of the word), why are they currently under-utilized? (Dillon, Morris, O'Donnell, Reid, Rickinson & Scott. 2005). Research shows that there are significant barriers to implementing more effective forms of education such as lack of funding, time, experience (on behalf of the teachers) and institutional resistance (Dillon *et al*, 2005; Rickinson, Dillon, Teamey, Morris, Choi, Sanders, 2004).

The development of sustainability literacy, an ethic of care, enjoyment and engagement in learning should be the paramount features of New Zealand schools, not achievement (Sustainable Aotearoa New Zealand, 2009). We are living in a time where globalization, rising population, climate change, increased individualization, increasing uncertainty and the gradual disintegration of social norms and guidelines already undermine the basic fabric of society (Paul, 2006). These rapid changes pose threats to democracy (Giddens, 2012), economic production (Fukuyama, 1995; Young, 1998), culture, community (Landgraf, 2005) and the environment (Huckle, 2014; Orr, 1991; Sterling, 2004). The present educational system struggles to prepare students for the challenges of today, let alone for the demands of the future (Paul, 2006). In education (particularly at a secondary level) there is a tendency to teach students the 'history of knowledge' without showing them the process of creating knowledge or engaging them in knowledge creation of their own (Bowers, 2001; Pink, 2012).

In my education I have come to realize that the Outdoors offers an ideal environment for developing sustainability literacy, especially for learners who do not succeed to their potential in the traditional system. I have run weekend courses in outdoor pursuits (hiking, mountaineering) for years and can vouch for the fact that students can be disruptive/disengaged/underachieving at school and portray the polar opposite in an outdoors setting. Rios and Brewer (2014) note that outdoor learning experiences are effective in raising achievement and fostering positive environmental attitudes. Further evidence of the positive effects of outdoor learning can be seen in the studies of Davidson (2001), Hattie, Marsh, Neill and Richards (1997), and McLeod and Allen-Craig (2007). These studies have attributed improvements in self-esteem, confidence, social skills and reduced stress to the outdoors setting. Berman, Jonides and Kaplan (2008) argue that exposure to nature improves mental ability which can translate into improved academic success. Nadelson and Richards' (2012) study on the effect of field trips on student learning found that the outdoor learning experience is the most frequently recalled part of their Science course.

EfS provides students with the adaptable tools needed to navigate a changing world. The world needs people who care AND act on their concerns. It is vitally important that students are engaged and interested in their learning – students don't develop an ethic of care for the environment without having a values system created via

spending time in and around the environment and appreciating why it is worth looking after. Any environments' sustainable future is reliant upon our perceived value of it.

In my intervention I chose to use EfS as an 'umbrella' under which other theories could be included in a flexible form of education. These other education theories for engaging students and modelling sustainability literacy include Outdoor Learning, Issues Based Education (IBE) and Place Responsive Education (PRE). These four education disciplines (EfS, Outdoor Learning, IBE and PRE) are closely aligned and have strong potential for collaboration. Critique of these 'alternative' forms of education report that change to contextual learning will lead to lower academic achievement and that simply going outside doesn't make you a better person or help you care anymore for your place (Lugg, 2007). On the contrary, if structured in the right way, 'going outside' can have great benefits, which is where my intervention framework comes in. I believe that students can be engaged, develop an ethic of care for their 'place' and improve their sustainability literacy whilst maintaining their academic success. Changing the setting is not enough, pedagogy itself has to change to create a more conducive 'environment' for learning.

Teaching under the umbrella of EfS makes sense, given that EfS provides a multi-disciplinary framework that is relevant, meaningful and flexible (Breunig, Murtell & Russell, 2015). Dolan (2015, p.57) states that sustainability is applicable to all curricular areas due to its "holistic nature". EfS takes student input into account when planning the context, an important factor in securing student 'buy in'. A major strength of EfS is that it can be taught critically at the senior level to empower and arm students with the skills needed to make a change in the world (Grunewald, 2003). Hill and Brown (2014) report on the natural integration of Outdoor Learning and EfS, noting that by teaching in this manner we can improve the connection of students with the setting and foster a deeper understanding of sustainability than is possible in the classroom. Exposure to the outdoors is a contributing factor to developing a sense of kaitiakitanga or guardianship over the environment, particularly for indigenous students (Eames & Barker, 2011).

1.4 Purpose of the research

The purpose of this research was to see if students gain a deeper understanding and appreciation of the place (The study takes place in the Karangahake Gorge, a popular walking area within the Kaimai-Mamaku forest park) and develop sustainability literacy through taking part in Outdoor Learning based around the issue of water quality. A secondary purpose is to test the effect of an integrated EfS/ Outdoor Learning/ IBE and PRE approach on teaching/learning Science achievement standards.

1.5 Research questions

This purpose led me to the following questions:

1. What are the student experiences of a school camp based on PRE, IBE, Outdoor Learning & EfS principles?
2. How does an issues based, outdoor camp based on EfS and PRE principles affect the sustainability literacy of student participants?
3. What is the contribution of an issues based, outdoor camp based on EfS and PRE principles to student achievement?

1.6 Scope of the research

The research gathered data from a set of 13 participants who were Year 10 students (14-15 years old) at a Decile 6 school in the Bay of Plenty. Data were gathered via a pre and post questionnaire, a focus group interview at the end of the intervention, researcher notes and participant assessments. Data were then analyzed to identify trends in sustainability literacy, enjoyment, engagement, achievement and knowledge progression as a result of participating in the intervention.

1.7 Significance of the research

There are several reasons why this research could be significant for my own practice and the practice of other education professionals. The first is to see if running contextual block courses works for students and teachers – as my current school is looking at running a block based course for seniors in the future (meaning that achievement standards are taught together, in context, in blocks that students opt into). If this pilot is

a success then the school may look at trialing an integrated, contextual, sustainability based outdoors program. Secondly, I am developing a senior EfS programme based around the EfS standards. This research will inform my pedagogy, which will in turn improve the nature of the experience for future students.
Thirdly, it is effectively a trial for future camps, future senior programmes and future education initiatives to lift the achievement and engagement of students. My school is not overly concerned about whether students develop sustainability literacy or action competence, they are not an enviro-school, nor do they currently have any Sustainability goals of their own. Fourth, it is a trial of a method that could be used to establish strong positive relationships between students and teachers.

In a wider sense my study would be useful to any secondary school worldwide that is looking at improving the educational outcomes of their school camps, creating a course under the umbrella of EfS, improving the outcomes of all students, fostering positive interpersonal relationships or running an alternative course for under-achieving students. The study would add to the body of work that supports EfS, Outdoor Learning, IBE and PRE as effective methods of education.

1.8 Thesis structure

Following this introduction, the literature surrounding the main concepts inherent in my thesis is reviewed (chapter two). This includes learning theories that underpin my personal pedagogy. EfS, sustainability literacy, action competence, Outdoor Learning, PRE and IBE. Lastly, the educational dynamics specific to New Zealand at this point in time are elaborated upon.

In chapter three the methodology used to gather the data is outlined. This includes a description and justification of the intervention design, the methods used, selection of participants, data analysis process, limitations of the research, validity and reliability of the data, and ethical issues related to the process.

In chapter four the data gathered from the intervention is presented. This includes synthesised data in the form of tables and graphs to show trends in the areas of concern (sustainability literacy, action competence, knowledge, achievement, experience and engagement in learning).

Chapter five discusses the findings in relation to the research questions. It compares the findings of this research to the findings of others and explains the implications of the research, recommendations for improvements, and avenues for further research.

2. Literature Review

2.1 Chapter overview

My thesis draws on several different theoretical frameworks. In this chapter, I describe each in turn, with recent evidence from studies where appropriate, and discuss why they are relevant to my research questions, then outline the links between them. To begin I address general learning theory, which informs my personal pedagogy as a teacher who is researching his own practice. I am researching my own practice in order to improve my ability to facilitate learning of EfS. Understanding my own pedagogy is important because it underpins all of the decisions that I made within the design and the carrying out of the intervention reported in this study. Following this, I discuss the concepts of engagement and achievement and why I targeted them in my intervention. I then review the fundamentals of EfS, which is the principal subject area and pedagogical foundation of this study. This is succeeded by a description of the concepts of sustainability literacy and action competence, which are two key aims of EfS and two of the elements that I examined within my study. Then I discuss Outdoor Learning, which is a subject area related to the setting of my study, and as such it greatly informed my pedagogy design. This connects with PRE as another important area of study that has informed my pedagogical approach. I also review IBE, a learning area which has greatly helped to form the context of my study. Lastly, I examine the links between all of these different aspects of my study, outlining the ways in which they intersected to form my theoretical position from which to create a rich learning experience for students.

2.2 Learning theory

Learning theory is important to my thesis as it informs my personal pedagogy, which greatly influenced the intervention that I engaged in through Action Research. Learning theory is simply an idea or set of ideas about how we as humans learn new things. Before discussing the learning theories that were important in this study, it is important to attempt to define what learning is. Learning can be defined as a multidimensional process that leads to a change in an individual, and this change affects the way that the person perceives the world and responds to it

(Alexander, Schallert, & Reynolds, 2009). Learning is turning something from unknown to known, whether consciously or unconsciously. The 'something' can be knowledge, emotion, sensory perception, physical or otherwise. The means by which this happens are highly debated and there is no widely adopted consensus on what learning is or how it happens (Qvortrup, Wiberg, Christensen & Hansbøl, 2016).

Gagne, Briggs and Wagner (1992) categorized learning into three main domains: Affective (emotional and spiritual), Cognitive (intellectual) and Psychomotor (physical and sensory). A similar theory was put forth by Fredricks, Blumenfeld and Paris (2004) who supposed the three domains as thinking, feeling and action. Traditionally, schools have been guilty of favouring learning in the cognitive domain over the affective and psychomotor domains to the detriment of the learner (Fraser & McGee, 2012, p. 24). Learning rarely fits into just one of these domains, as most learning is a combination of two or more domains, which increases student engagement in learning (Corso, Bundick, Quaglia, & Haywood, 2013). EfS has been shown to be a form of education in which all three domains can be met, allowing for deep learning (Wake & Eames, 2012).

Learning does not all happen at the same speed, some things are harder to learn and take more time, usually when there is a lack of prior knowledge (Clapper, 2012). Learning also varies from person to person – what is easy for one individual may be incredibly difficult for another (Sahlberg, 2007). But why do students learn the same thing at different speeds? This is a complex question with an equally complex answer: our proficiencies and understandings are shaped by our genes, life experience, unique abilities, psychological proclivities, not to mention sleep, diet and countless other variables (Bransford, Brown & Cocking, 1999, p. 102-114). As educators we need to create an environment where students can learn at their own speed, whilst still being challenged to progress. The one size fits all method of learning that is so common in secondary school education often does not meet the needs of the students (Eames, Cowie & Bolstad, 2008). In my intervention, I wanted to create a responsive pedagogy/course of learning that would be relevant to students and engage them with EfS in a way that made learning enjoyable.

Learning theories come from a variety of fields of research (medical, psychological,

science, linguistics) and are generally not grounded in day to day teaching observations. Instead, they are big picture philosophical theories that sometimes complement each other and sometimes compete with each other (Bransford, Brown & Cocking, 1999, p. 68). Five common learning theories in the field of education are Behaviourist, Developmental, Humanistic, Social-Constructivist and Socio-Cultural. Teachers very rarely subscribe exclusively to any particular learning theory, most teachers' pedagogy is an unconscious amalgamation of aspects of different learning theories (Fraser & McGee, 2012, p. 40). I am no different as a teacher, and my personal learning theory (and the theory inherent in EfS, PRE, Outdoor Learning & IBE) integrates three key learning theories, which are explained in the next section.

2.2.1 My learning theory

The theories that I personally identify with and are influential in guiding my approach in this study are the Humanistic, Social constructivist and Socio-cultural learning theories. These theories are inherent in the philosophy and pedagogy of the fields of research that I have drawn upon in my methodology, namely EFS, PRE, IBE, and Outdoor Learning. They also ring true to my own personal teaching philosophy.

Aspects taken from Humanistic theory

Humanistic theory draws on the work of Freud, Jung and Roger (Fraser & McGee, 2012, p. 30-31). The theory came into prominence in the mid 1960's and the ideas within have been widely adopted, particularly within Education. Humanistic theory proposes that: effectiveness of learning relies on the relevance of the content/context to the individual's own life, experiences and intentions; that most learning is obtained via execution and experience; that learning takes place when it is initiated by the learner; and that when learning involves a combination of feelings (affective), intellect (cognitive) and discipline, it is at its strongest (Gagne, Briggs & Wagner, 1992). The philosophical assumption that underpins these ideas is that subjective reality is guiding human behaviour (Sinnott, 2008). In other words, humanistic theory acknowledges the subjectivity inherent in every individual and encourages teachers to consider this in their planning and pedagogy. Humanistic theory also requires that the teacher acknowledges the learner as a person and recommends that they establish a connection with them before they engage in

teaching and learning (Noddings, 2005, p. 15).

Humanistic principles are present in the philosophy of EfS, PRE, Outdoor Learning & IBE. There are a multitude of benefits to incorporating a Humanistic approach in my intervention. By taking the individuals into account in their planning, the learning is catered towards the students, increasing the relevance of the content and context. Taking individuals into account means teachers are required to get to know their students – their interests, their background, their personalities. This process not only informs pedagogy, it also forms strong relational bonds between teachers and students, which is a strong motivator for student engagement, achievement and enjoyment (Bishop, Berryman, Cavanagh, Teddy, 2009). Learning is negotiated between the students and teacher to create meaningful, rich experiences that draw on students' prior knowledge. This approach to planning gives students voice in their education, which increases engagement, achievement and enjoyment (Naude, Van Den Berg & Kruger, 2014). I applied these Humanistic principles to the planning and pedagogy of my intervention, as is discussed in Chapter 3.

Aspects taken from Social-constructivist theory

Social-constructivist theory developed over time and was most strongly influenced by the work of Vygotsky, Piaget, Kelly, Ausubel and Bruner (Fraser & McGee, 2012, p. 30-31). It is a relatively modern learning theory, coming into prominence in the early 1990's. The main idea within Social constructivism is that learning is supported and enhanced by interacting with others (Woolfolk, 1993). Learning is a social phenomenon that requires thoughtful pedagogy, aiming to keep the learner in the 'Zone of Proximal Development' (ZPD) (Vygotsky, 1962). The ZPD is essentially a space where the student is challenged but supported – with just the right amount of challenge so that the learner does not become bored (too easy) or have no chance of success (too hard). The learning process within the ZPD involves connecting both past and present ideas and experiences, regularly requiring expanding or reconsidering pre-existing ideas (Vygotsky, 1978). Social-constructivist theory acknowledges that pre-conceived ideas and values have a strong influence on student perceptions, actions and ideas (Ausubel, 1968, p. 6).

The ideas within Social-constructivist theory can be seen in the philosophy of EfS, PRE, Outdoor Learning & IBE. Teachers who include the ideas of Social-constructivist theory within their practice deviate significantly from the traditional

'lecture style' teaching method and tend to take the role of facilitator (Adams, 2006). Similar to the humanistic approach, students are given a voice in their education and consequently they are involved in the construction of learning content/context which considers students' prior knowledge, thereby increasing relevance to the individual (Levin, 2000). Relevance results in increased engagement, achievement and enjoyment for the students (Schlechty, 2002). Within this approach, the teacher purposefully designs learning so that there is a social element to it. This results in less competition between students, which reduces stress and increases co-operation, engagement, enjoyment and achievement (Jonassen, 1999). Group learning activities are commonplace, which has the benefit of students being able to assist one another, discuss ideas and come to common decisions. This style of learning fosters co-operation, discussion, the ability to relate to others, the ability to empathize with others, and to critically analyse ideas (Lugg, 2007). Many of these benefits fulfil goals within the vision, principles, values and key competencies of the *New Zealand Curriculum* (NZC) (Ministry of Education, 2007). Group learning allows the teacher to purposefully create mixed ability groups, this values the group above the individual and allows for the Tuakana-Teina (older sibling/younger sibling) approach recommended by Bishop, Berryman and Richardson (2002). The learning process under Social-constructivism is therefore supported not only by the teacher, but by the whole class. Many of the principles of Social-constructivism are already present in my personal pedagogy and I applied these beneficial constructs to the planning and pedagogy of my intervention, as is discussed in Chapter 3.

Aspects taken from Socio-cultural theory

Socio-cultural theory is the most recent widely accepted learning theory, coming to prominence in the mid 1990's with the work of Lave and Wenger's 1991 paper – *Situated Learning* (Lave & Wenger, 1991). The theory is essentially an extension of the ideas inherent in Social constructivism theory with a stronger focus on culture (Fraser & McGee, 2012, p. 30-31). Central to Socio-cultural theory is the idea that learning is as much about who you are as what you know, therefore learning requires exploration within and between cultures and communities (Rogoff, 1991). Culture does not solely refer to ethnicity, everything has a culture associated with it – each school has its own culture as does each subject (Lave & Wenger, 1991). Learning must be linked back to the cultural domain in order for it to be relevant

and meaningful. Within this theory, the teacher is essentially a navigator between different cultures or ways of knowing and attempts to draw upon the students' cultural locations as a way of connecting them with the curriculum (Lave, 1991). Learning has to immerse the student in the culture of that which they are learning in order for it to be successful (Rogoff, 1995)

Socio-cultural theory has many parallels with the recommended pedagogy in the fields of EfS, PRE, Outdoor Learning & IBE literature. The idea of culture within Socio-cultural theory is holistic, which relates to the holistic meaning of Sustainability within EfS (taking into account social, economic, political and environmental aspects) (Pappas, 2012). The idea of exploring the culture of a context relates strongly to PRE in that it agrees that engaging with the bigger concept of a 'place' is necessary to connect with it (Ross, Christie, Nichol & Higgins, 2014). The main benefit of applying Socio-cultural theory in practice is an increased relevance to students through connecting with students' 'culture'. Because the notion of 'culture' is so broad within Socio-cultural theory, there is room within the pedagogy for students to explore all aspects of their identity. This allows students to explore and connect with their own 'culture' which gives them a stronger sense of belonging, purpose and self-confidence (Bishop & Glynn, 2000). This opportunity for relevance and development/exploration of the individuals' 'culture' leads to greater engagement, enjoyment and achievement. I applied these Socio-cultural principles to the planning and pedagogy of my intervention, as is discussed in Chapter 3.

Summary of learning theory

I have given an outline of what learning is, and have described the three learning theories that form my own personal pedagogy. An explanation of 'engagement' and why engagement is an issue worth addressing (by utilizing the pedagogy outlined above) follows.

2.3 Engagement

Engagement can be defined as a psychological, emotional investment in learning that comes about through connectedness to, interest in, and passion for academic content, as well as a connection to others within the learning environment (City, Elmore, Fiarman, & Teitel, 2009). Fredricks, Blumenfeld and Paris (2004, p. 60)

have defined it as being "engaged in thought, engaged in feeling, and engaged in action". Each of these categories can be further defined. Engagement in thought requires challenging academic material, metacognition, self-control and a desire for challenge. Engagement in feeling requires a connectedness to peers, teachers and the sense of belonging that comes from these relationships. To be engaged in feeling also applies to the students' connection and desire to learn the academic content. Engagement in action shows up in the students' positive learning behaviours such as completing work, being punctual and so on. Engagement is important, as it leads to students making better life choices, and being more successful academically (Antaramian, Huebner, Hills, & Valois, 2010; O'Farrell & Morrison, 2003). Other benefits include more social confidence and improved mental health (Taylor & Nelms, 2006).

2.3.1 The engagement issue

Klem and Connell (2004) found that up to 60% of high school students in New Zealand are 'chronically disengaged'. Studies have shown that students can become less engaged as schooling goes on, due to a lack of relevance to their personal interests, cultures and communities (Eccles, Wigeld, & Schiefele, 1998). Decreasing engagement in secondary schooling has become exacerbated in recent years due to the rapid availability of information via the internet, increasing the redundancy of the industrial teaching model (Kane & Maw, 2005; Virtanen, Lerkkanen, Poikkeus, Kuorelahti, 2015). Teachers and schools have not sufficiently adapted to the new world that we live in, and because of this they are becoming redundant (Klem & Connell, 2004). Teachers need to change their role, from the keepers and distributors of knowledge, to the facilitators of learning (Chapman, McPhee & Proudman, 1992). Knowledge is everywhere, but students don't necessarily know how to access it and they don't know what they don't know. That's where teachers come in. The problem is that the existing status quo in New Zealand secondary schools makes it difficult to move into the role of facilitator (as recommended by social-constructivist theory) due to the constraints of the timetable, institutionalised staff/management and a dominant focus on assessment through the NCEA (Elley, Hall & Marsh, 2004).

There is a need for a new pedagogy in the New Zealand secondary school system, one that is more successful at engaging students and allows for achievement to

happen, but does not pursue it as the goal (Lugg, 2007). This is the standpoint of the learning theories I have described (Humanistic, Social-constructivist & Socio-cultural) and is a way of putting the focus on the learner/learning process. EfS has been recommended as the universal theme for education in New Zealand because it subscribes to this approach and is flexible enough to fit any school regardless of location, decile or cohort (Cortese, 1999, p. 8).

Next, I outline achievement, because, despite the fact that my personal pedagogy and my theoretical standpoint does not value achievement as the main goal of education, my school does. It is, therefore, important to outline what achievement is and why it is relevant to my research.

2.4 Achievement

Achievement can be defined as doing something with effort, skill or courage. It is utilizing your myriad faculties to persevere and reach a challenging goal (Cizek, 1996). Achievement is not something that comes easily, it is always something that is fought for (Vygotsky, 1962). Does achievement in schools as we know it match this definition? Most New Zealand schools' interpretation of the flexible and forward thinking NZC (Ministry of Education, 2007) is relatively rigid, with little deviation from the tried and tested traditional education model (Eames & Barker, 2011; Russell, 2004). As a result, achievement as a concept for students is highly variable and often diminished or incomplete (Houtenville & Conway, 2008). Without individual learning plans or a flexible pedagogy/curriculum that can cater to each individual, it is difficult to ensure that every student is challenged and kept in the "zone of proximal development" (Vygotsky, 1962).

2.4.1 The achievement issue

Essentially, the achievement issue is that achievement has been put on a pedestal as the purpose of education, which has led to a stagnation of pedagogy in New Zealand, resulting in less engagement, less enjoyment and ironically – less achievement (Russell, 2004). To understand how to improve achievement – it is necessary to delve into the current state of achievement in New Zealand, which is determined by a qualification set by the Ministry of Education called NCEA. NCEA is an assessment system which was released in New Zealand in 2002. The design

of NCEA was intended to be flexible to allow for the interdisciplinary, contextual and student-centred approach recommended by the NZC (Ministry of Education, 2007). Unfortunately, NCEA and the NZC have not been utilized for their original intended purpose due to the demands of the previous right leaning National Government (Hume & Coll, 2009). From 2008-2012 New Zealand had a governing party with unsustainable neoliberal economic policy at its core (McMaster, 2013). Because of this, Education was seen as a business – and businesses need to be seen to continually grow their profit margin. In the context of education this was seen in the Government demanding higher and higher rates of NCEA achievement from schools. This places immense pressure on principals and consequently teachers to meet these demands, as an unsatisfactory NCEA achievement rate results in a review from the Educational Review Office (ERO) which can be devastating for a school's reputation. This pressure forced schools to put achievement above all else, which resulted in a strong reliance on the transmission model of teaching – because it efficiently disseminates the content that students need to know so that students can pass the multitude of assessments that make up NCEA (Hume & Coll, 2009).

Thankfully, New Zealand has a new governing political party as of 2017. The Labour Party has identified education as one of its key areas of focus within their 3-year term (Ardern, 2017). One of their first acts was to immediately begin reviewing NCEA/the implementation of NCEA. As a result, an announcement was recently made that the guidelines for NCEA may change to take the focus off achievement (Moir, 2018). The article stated that the focus of NCEA at Level 1 is likely to be directed towards student-led contextual learning, with less internal assessment and no external assessment. This announcement is bound to be well received by teachers, as it will allow them more time and freedom to utilize more effective pedagogies (such as those listed above) in engaging their students in learning. It will take time for these changes to take place, schools are currently still responding to the demands of the previous government and will be for at least the entirety of 2018. The new government's approach to education is a positive sign that the educational environment in New Zealand is becoming more receptive to the pedagogies required to effectively deliver EfS.

Within my intervention, achievement is not my main goal – but I need to measure it to ensure that I meet the needs of my school who are still responding to the achievement demands of the previous government. I also need to measure

achievement because my research has led me to believe that the pedagogy I am employing will serve to improve achievement – so I need to see if that is indeed the case. Experience within the pedagogies that I have outlined will be useful in this receptive educational climate, as will knowledge of how to effectively implement EfS. For the first time in a long time New Zealand is embracing change within the education system and EfS is the ideal educational approach to meet any new guidelines for NCEA and prepare students with the education required for creating a sustainable future (Sustainable Aotearoa New Zealand, 2009). A discussion of why EfS is the future of education in New Zealand follows.

2.5 Education for Sustainability (EfS)

Education for Sustainability has always been important to human beings as it teaches us to live within our means, to respect and value the world that sustains us (Sauve, 2010). The Earth will become inhospitable if we do not live in a sustainable manner – which can be seen in climate change due to human use of unsustainable fossil fuels (Waddock, 2011). Over time, industrialization, globalization, capitalization and the disintegration of communities has disconnected humans from the environment (Huckle, 2014). This disconnection has allowed for all manner of environmental challenges to occur (Sustainable Aotearoa New Zealand, 2009). When people do not perceive themselves as relying on their environment, they have little motivation to care for it. EfS looks to deeply connect people with their environment (Barker & Rogers, 2004). In this day and age, there is a definite need for EfS.

EfS can be defined as "learning to think and act in ways that will safeguard the future wellbeing of people and our planet" (Ministry of Education, 2015).
EfS is a means of providing an enlightening experience in the context of learning in, about and for the resources that sustain all life on Earth (Barker & Rogers, 2004). These resources include environmental resources, social resources, cultural resources, political resources, and economic resources (Bolstad, 2003). The key concepts within EfS in New Zealand are described as Sustainability, Equity, Interdependence and Responsibility for action (Ministry of Education, 2015). At a secondary level, this can take the form of contextual units based around real world problems that are identified by the student, and carried through to real world

solutions (Hill, 2012; Wake & Eames, 2013; Williams, 2012). In creating real world solutions, students are learning to be 'Action Competent' which enables them to take future action as adults (Jensen & Schnack, 1997). By learning to think and act in a sustainable manner, students become leaders and active democratic citizens (Ministry of Education, 2007). EfS teaches students to have an open mind, it connects students with different perspectives and forces them to be introspective in relation to their own views as well as negotiating group decisions (Smith, 2007). In this regard, EfS strongly taps into the ideas inherent in Humanistic, Social-constructivist and Socio-cultural learning theory. Within EfS, students critically analyse issues and standpoints – always looking for the cause rather than the symptom. This teaches students to think logically, rationally and critically (Smith, 2007). There is a focus on creating new knowledge and establishing links between different curriculum areas in an effort to solve real world problems. The community, the outdoors and the global community are all seen as learning resources (Aikenhead, 2005; Lefebvre, 2000; Ministry of Education, 2015).

EfS may be the most important form of education for students because it gives individuals the tools and confidence to be active, motivated, empathetic, democratic citizens (Maiteny, 2002). I believe that the concepts of Sustainability should be deeply embedded in our national psyche, and that the best way to do so is through education. Sustainable Aotearoa New Zealand (2009), in *Strong Sustainability for New Zealand*, argued that as a nation we need to shift away from the continual growth model (as perpetuated by neoliberal economic policies) and realize that growth is limited to what the environment can sustain.

2.5.1 EfS in New Zealand

In the history of EfS, one of the most important milestones was the *Tbilisi Declaration* in 1978 (UNESCO-UNEP, 1978) which mandated environmental education for people of all ages, levels and in all forms of education (Gough, 2013). New Zealand has partially fulfilled this mandate by implementing EfS policies and mandates at national and international levels, although they have a long way to go (Chapman, 2011). Historically, within secondary schools there has been very little EfS taking place (Eames & Cowie, 2004), although this is beginning to improve as more teachers become knowledgeable in EfS, more support networks are

established and educational policies put EfS as a priority. Many schools within the Early Childhood Education (ECE) and Primary education sectors in New Zealand have a well-established culture of EfS through 'Enviroschools' – an EfS based, non-profit, 'bottom up' education model/network which was first piloted in New Zealand in 1993 and had 34% of school involvement nationwide in 2015 (Toimata Foundation, 2015). There has been some uptake of 'Enviroschools' by Secondary Schools (24% of schools nationwide in 2015), although the growth in numbers of schools adopting the model is not as strong as within the Primary sector (Toimata Foundation, 2015). Also, the extent to which EfS is adopted within the Secondary schools does not tend to be as comprehensive as within Primary schools (Eames & Barker, 2011). On a positive note, the Department of Conservation, The Ministry for the Environment and The Ministry of Education recently collaborated on the '*EfS Strategy and Action Plan'* (Department of Conservation, 2017) which is another significant step towards widespread EfS. The plan is a well thought out, co-ordinated, multi-departmental effort to raise awareness of EfS, strengthen support networks, build the capability of educators and monitor the change. New Zealand's political climate has changed, and the new Labour-led government led by Jacinda Ardern has stated that acting on the climate change issue is this generation's 'nuclear-free moment' (Ewing, 2017) which bodes well for the future integration of EfS in mainstream education.

The reason that EfS has not been adopted as fast as the rapidly deteriorating environment requires is a combination of the policies of the previous political party in power, the historical lack of funding for the implementation of educating educators about EfS (Chapman, 2011), the lack of time that teachers have to learn about and implement EfS (Eames, Cowie & Bolstad, 2008), the lack of teaching resources (Eames & Cowie, 2004), and the reluctance of the education system at large to change (Gough & Scott, 2001). As it stands, there is no mandatory requirement for EfS in Aotearoa N.Z., however, and the document guiding this work (*Guidelines for Environmental Education in New Zealand Schools*, Ministry of Education, 1999) is antiquated, scripted under neoliberal economic policies and ripe for revision (Chapman, 2011; Eames & Chapman, 2008). Despite the lack of compulsion in policy, schools are encouraged to develop EfS programs via school based curriculum development by the NZC but only as an option (Ministry of Education, 2007). Sustainable Aotearoa New Zealand (2009) suggests that for EfS

to thrive the agenda for education should be apolitical, and this is echoed by the work of Chapman (2011) who showed how susceptible New Zealand's education system is to the priorities of the political party in power. An apolitical approach to education should focus on preparing people to anticipate and cope with major changes in living and working environments (Sustainable Aotearoa New Zealand, 2009). This suggestion echoes the values-based approach to education suggested in the NZC (Ministry of Education, 2007) and in the recent government announcement relating to NCEA mentioned earlier.

Within this climate, EfS is an ideal approach as it can satisfy both the achievement goals of one government, and the big picture/forward thinking goals of another. Academic success can come out of a holistic multidisciplinary approach under the umbrella of EfS, with far more additional benefits to the students (Kopnina, 2014). I now discuss ideas for pedagogy for implementing EfS in Secondary schools in New Zealand.

2.5.2 Pedagogy of EfS

The process of developing a Sustainability ethic is a complex one (Tilbury, 1995). There is limited evidence of a linear relationship between EfS and environmentally responsible behaviour (Eames, Cowie & Bolstad, 2008; Stevenson, Dillon, Wals & Brody, 2013). This may be due to a small body of research in the area, something that I am adding to through my research. There are a lot of different ideas in EfS literature concerning what teaching and learning for EfS looks like, however, there is a consensus that pedagogy in schools needs to change significantly for EfS to be delivered effectively. EfS "is best taught collaboratively in conjunction with other subjects and supported by school and community policies and practices" (Ministry of Education, 2015).

EfS should not only be concerned with the environment, it needs to be linked with a concern for democracy (Jensen & Schnack, 1997) and an understanding of aesthetic, social, economic, political, historical and cultural elements of Sustainability issues (UNESCO, 1992). Relevance needs to driven by the students, rather than assuming that they will relate to issues selected by the teacher (Lundholm, Hopwood & Rickinson, 2013). Programmes should be open ended to

allow for critical thinking and decision making (Jickling & Spork, 1998), and emancipatory to empower students to dramatically transform society (Huckle, 2014). This indicates the importance of co-constructing any teaching intervention with students, engaging students with the different aspects of Sustainability through providing interactions with stakeholders, and structuring the intervention so that students are creating meaningful data that can be used to remedy the issue being studied.

Prior to engaging with issues, teachers should engage the students in 'Values clarification' (Tilbury, 1995). A values clarification approach involves finding out the values of the students, getting students to understand the environmental consequences of their position, introducing them to alternative values and getting them to make decisions on their values based on rationale (Tilbury, 1995). It involves teaching an awareness of how a variety of factors such as religion, culture, socioeconomic class, gender and race influence values. This approach is supported by the learning theory of Vygotsky in that values are deconstructed and reconstructed (Huckle, 2014). In addition, Bonnett (2013) suggests that students also develop values based on a non-anthropogenic point of view. Looking at issues from non-human perspectives can lead to greater understanding of issues, and empathy with other species (Bonnett, 2013).

Following on from the values clarification it is recommended to engage in active and experiential learning, making sure that students are learning in, about and for the environment (Huckle, 2014). UNESCO (1992) suggests issues-based learning as the vehicle: identifying issues, investigating them, seeking solutions and carrying out actions to address them. In this respect educators need to make sure that students are addressing the cause, not the symptoms, of Sustainability issues (Breiting & Morgensen, 1999). Several researchers have, however, warned against learning about the causes and severity of the world's problems, stating that this can lead to feelings of despair and hopelessness (Hicks & Bord, 2001). Jensen and Schnack (1997) maintain that the problem is more how to handle the anxiety and worry that students already feel. Or, to pre-empt the worry and anxiety and arm the students with the resilience to deal with it.

After the active and experiential learning phase, it is recommended that students plan for and get involved in an action. There is an abundance of research advocating for an action oriented approach to EfS, in other words making sure that the 'for' the environment aspect of EfS is done justice (Eames, Law, Barker, Iles, McKenzie, Patterson & Mills, 2006). Wals (1990) states that an action based approach is required in order to foster adults who take action. This action can be direct or indirect, but it must be focused on the cause, not the symptom, of the issue (Jensen & Schnack, 1997). Birdsall (2010) warns against the misuse of direct action, not all causes can or should be solved by the students, especially when companies need to be held responsible for their unsustainable actions. Jensen and Schnack (1997) state that actions need to make a difference, or else attempted action that fail to make a difference can lead to indifference in students. This complicates things, as depending on the issue, a 'difference' can actually be very hard to measure as a singular action may just be one component of the whole.

2.5.3 Benefits of EfS

There are a multitude of benefits to introducing students to EfS. An important principle within EfS is relevance (Tilbury, 1995). Because EfS is flexible, it can be adapted to fit individual interests, places and situations. This allows the curriculum to be relevant to students, which increases engagement, achievement and enjoyment. EfS has been touted as a transformational and emancipatory form of education, because it gives people the skills, knowledge, values, commitment and opportunity to make a difference to the world around them (Parliamentary Commissioner for the Environment, 2004, p.36). The pedagogy of EfS cultivates critical thinking via looking at root causes of problems and evaluating potential solutions (Jickling, 1997). Because of this, EfS creates active democratic citizens, something which is sorely needed in this era of apathy (Giroux, 2001, p.168). EfS has been argued as a form of education that legitimately prepares students for participation in all aspects of life (Lasen, Skamp, & Simoncini, 2017). It has led to increased confidence and self-belief in students, as well as responsibility, initiative and sustainability literacy (Lasen *et al*, 2017). Despite these benefits, EfS has been relatively slow to be implemented in New Zealand schools, partially because school management often view EfS as being too radical and the traditional school structure is too prohibitive (Scott & Oulton, 1999).

2.5.4 Critique of EfS

EfS is a powerful form of education that can have a multitude of benefits. But with great power comes great responsibility. The problem with EfS being so open in its nature is that its implementation is open to interpretation. This can and has led to cases of indoctrination by teachers, bending EfS to serve their own personal views, political standpoints and misinformed 'facts' (Cotton, 2006, p. 224; Jickling, 1997, p. 96; Newman, 2007, p. 2). It can also lead to simplified versions of EfS masquerading under the banner of EfS (Birdsall, 2015). However, if the flexibility of EfS was removed, it would not be able to serve its purpose. The problem therefore, lies in the lack of teacher education, support and infrastructure (Eames, Cowie & Bolstad, 2008). It is reasonable to assume that teachers of EfS generally have good intentions, they may just be misguided in their delivery. EfS educators need to be effectively educated so that they can educate effectively.

The other main critique of EfS is shared with the other pedagogies described in this literature review. Opponents argue that because EfS is in its nature multidisciplinary and contextual, that students miss out on the breadth of knowledge that they would be exposed to in traditional classrooms (Eagan, Cook & Joeres, 2002). EfS proponents refute that breadth of education is more important than depth. When the aim is to create a relevant curriculum you need to access student voice, and a predetermined inflexible curriculum has no place within EfS.

If EfS is the cause, then sustainability literacy is the effect. In order to plan a successful intervention and to measure the effect of EfS pedagogy it is necessary to know more about sustainability literacy. A description and a 'checklist' for sustainability literacy is detailed below.

2.6 Sustainability literacy

Sustainability literacy is essentially a measure of how sustainable a person, group of people or organization is or has the potential to be (Murray, 2011). Sustainability literacy is the desired result of EfS and hence, it is a key aim within my study. To be sustainability literate is to understand and practice the key tenets of sustainability. It is to think and act in ways that conserve the welfare of the living

and non-living (Ministry of Education, 2015). Conversely, to be Sustainability illiterate is to have no knowledge, understanding or skills pertaining to Sustainability (Parkin, Johnston, Buckland, Brookes & White 2004, p. 9). Literature in this field describes the fundamentals of sustainability literacy as follows:

- A comprehension of an accepted definition of Sustainability, e.g. "development that meets the needs and aspirations of the present without compromising the ability of future generations to meet their own needs" (United Nations, 1987).
- Knowledge of the multiple dimensions of Sustainability (economic, social, environmental, cultural, political).
- The ability to see issues from a multitude of perspectives and decipher ways forward that all parties can benefit from.
- An open-mindedness to new ideas and perspectives.
- An understanding of the links between environmental, economic, political, cultural and social aspects of Sustainability.
- Problem solving skills that can be applied to intricate real world problems.
- The ability to see the big picture and how components interact with each other.
- A regular practice of self-reflection and the ability to critique the work of others.
- The capacity to thoughtfully adopt values which lead to a sustainable outcome.
- The ability to put thought and intention into action that leads to a sustainable outcome (action competence).
- To be collaborative, communicative and creative

(Dawe, Jucker, & Martin 2005, p. 58; Lefebvre, 2000; Pappas, 2012; Parkin *et al*. 2004, p. 9)

Sustainability literacy is something which can be learnt with appropriate engaging pedagogy, such as that detailed in section 2.4.2. It is important to keep the fundamentals of sustainability in mind when planning a course so that all of the aspects of sustainability literacy are catered to and students are able to develop a comprehensive understanding of sustainability. Individual sustainability literacy is highly affected by the way that one is raised, and as a result, adolescents (and adults)

may vary greatly in their individual sustainability literacy (Murray & Cosgrave, 2007; Murray, 2011). Because all students have a different literacy starting point, a teacher has to use pedagogy that caters to all levels of learners – such as the mixed ability groups recommended by Social-constructivism. One of the components of sustainability literacy is the concept of action competence. I have detailed this concept separately below due to the fact that it requires a different approach to measure.

2.7 Action competence

As mentioned above in section 2.4.2, taking action is part of the effective pedagogy of EfS and it is a key part of sustainability literacy. Action competence is essentially a measure of the ability of an individual to take responsible action that leads to a sustainable outcome (Jensen & Schnack, 1997). Furthermore, it is about having the skills, knowledge and confidence to take further action in the future (Jensen & Schnack, 1994, p. 190). This ability to take action stems from sustainability literacy. In order to take action, one must first understand the issue completely and be literate in the fundamentals of Sustainability (Birdsall, 2010). This requires comprehending the issue from all perspectives, considering potential actions, critiquing them, consulting stakeholders and coming to a well thought out, justified decision on which action is best to take (Mogensen, 1997).

Action competence is an idea that originated from Danish environmental education research (Jensen & Schnack, 1997). Researchers have proposed the following list of ideal qualities in an action competent person:

- Resolve.
- Adaptability.
- An emotional desire to change conditions (empathy, frustration, sorrow, indignation, hopefulness).
- An attitude of self-responsibility and self-accountability.
- Enthusiasm and courage to act.
- Knowledge about repercussions and sources to problems.
- Knowledge about, and ability to develop, innovative solutions to problems.
- Knowledge about how to alter conditions.
- The ability to put understanding to practical use. Employing a critical,

reflective approach.

(Breiting, Hedegaard, Mogensen, Nielsen & Schnack, 1999; Jensen & Schnack, 1997; Mogensen, 1995).

Just as for sustainability literacy, the educator has to keep these qualities in mind when designing an educational programme to develop action competence. And, just as in sustainability literacy, students will all have different initial levels of action competence, therefore requiring careful facilitation to keep students in the zone of proximal development.

There are many benefits to cultivating action competence in students. Through taking action, students often develop a passion for Sustainability that drives further actions (Jensen, 2000). Successful actions result in a personal feeling of pride, competence and confidence. Contributing to the community and helping others leads to a sense of meaning and accomplishment (Jensen & Schnack, 1997). Taking action fosters leadership qualities and engenders a sense of belonging and Kaitiakitanga (guardianship) with the local community/environment (Jensen & Schnack, 1997). Working with others to take action provides students with knowledge of the concept of interdependence within all aspects of Sustainability. Because students are required to be self-driven they develop maturity, accountability, initiative, and responsibility within the action competence process (Jensen, 2000; Jensen & Schnack, 1997; Mackey, 2012).

The setting in which an EfS course takes place is important because it has to be authentic and relevant to the context chosen by the students. There is a long history of Environmental Education taking place outdoors and a strong link between time spent outdoors and developing an environmental ethic (one of the key components of sustainability literacy). Also, just as EfS has been recommended to be taught in an interdisciplinary manner, the outdoors has been recognized as the ideal environment to learn in such a way (Lugg, 2007). Next, I detail research in the field of Outdoor Learning that I have used to inform my intervention.

2.8 Outdoor Learning

Learning outdoors is a natural process for humans, outdoors is our natural environment and where most of our historical learning has taken place (Donaldson & Donaldson, 1958, p. 17). Outdoor Learning can occur within any subject, it is not

specifically in reference to outdoor education as is often thought (Zink & Boyes, 2006). The term 'outdoors' can refer to rural, urban, or conservation areas – essentially anywhere outside that is not a traditional classroom. This is similar to the holistic definition of 'place' under PRE. Outdoor Learning is learning that is about the outdoors, in the outdoors and for the outdoors (Donaldson & Donaldson, 1958, p. 17). Environmental Education (EE) has taken place in an outdoor setting for years because it is the ideal setting to learn about in, about and for the environment. EfS is essentially the evolution of EE, with a wider scope and a wider definition of the 'environment'.

2.8.1 Pedagogy of Outdoor Learning

When structuring an Outdoor Learning experience there are several guidelines identified from research to keep in mind. It is important that any learning taking place outdoors is relevant to the environment itself so that students can relate to and engage in the learning (Brookes, 1989). In other words, it is no use being in the bush if you are studying volcanoes. The outdoor environment should aim to place students in the ZPD, therefore teachers must first have knowledge of their students. From this knowledge a suitable location can be chosen that has the opportunity for challenge in all three domains. At first, students can be out of their comfort zone in outdoor environments and sufficient time is needed for students to feel confident enough within the environment. This generally requires some teaching around environment-specific skills. Once relaxed and confident, students are much more likely to be open to learning and curious about the environment (Brookes, 1989). Because there is immediate feedback in the outdoors, learning can take the form of trial and error (Dewey, 1903). This process of experimentation lends itself well to the inquiry learning process, which is prominent in Outdoor Learning of Science and EfS. Much of the foundational research into Outdoor Learning was led by Dewey, who helped develop the experiential learning movement with his paper *Democracy in Education* (1903). Consequently, the roots of Outdoor Learning pedagogy are embedded in experiential learning which is strongly associated with child-centered pedagogy, critical theory, and constructivist theory (Mierke, 2013; Payne, 2015; Thorburn 2018; Thorburn & Ellison, 2017). Learning is personalized, social, experience based, perception based, reflective, and collaborative (Dillon, Rickinson, Teamey, Morris, Choi, Sanders & Benefield, 2006; Thorburn & Ellison, 2017). There are obvious links here to the pedagogy at the heart of EfS, and with

my personal pedagogy. It is important that my personal pedagogy aligns with that of Outdoor Learning, as teachers who hold social constructivist beliefs tend to have greater success with Outdoor Learning programmes (Glackin, 2016). Research into combining the pedagogy of EfS with Outdoor Learning has been positive, leading to increased sustainability literacy (Lugg, 2007).

2.8.2 Benefits of Outdoor Learning

Being within the environment in which the context is set allows students to see issues first hand and up close, so that they can gain a better understanding (Brookes, 1989). In contrast, indoor learning has been shown to limit the sensory experience of learning, resulting in less engagement (Lugg, 2007). Placing students into a challenging environment (such as the outdoors) promotes personal growth and psychological resilience by situating learners in the ZPD (Ewert & Garvey, 2007; Ewert & Yoshino, 2011). In addition, self-regulation and attention are improved outdoors, with less stress and anxiety than within the classroom (Keniger, Gaston, Irvine & Fuller, 2013). Trips of only a few days in length result in greater problem solving skills and concentration (Herzog, Black, Fountaine, & Knotts, 1997). Even walks of 20 minutes in parks have been shown to have the same effect as a dose of ADHD medicine (Taylor & Kuo, 2009). Driessnack (2009) went so far as to say that Outdoor Learning experiences can have an impact on growth, development and long-term health.

When students are on camp they are physically and mentally removed from school and its rules, culture and pressures (Brookes, 1989). Students are more open to learning in this setting because they do not react in the conditioned way that they do in their normal school day (Brookes, 1989). Students interact with each other more because social barriers are broken down and distractions such as personal electronic devices are generally absent. This links with the Social Constructivist foundation of EfS in that learning is a social phenomenon. In previous studies, students have commented that learning outdoors is more fun and more engaging than learning inside the classroom (Arnold, Cohen, & Warner, 2009). This can result in greater levels of academic achievement (Ofsted, 2008). The immersive learning experience provided by the outdoors leads to students retaining learnt knowledge long term because it is learnt at a much deeper level – appealing to the affective, cognitive and psychomotor domains (Dillon & Dickie, 2012; Fägerstam & Blom, 2013; Waite, 2011). In support of this,

Rickinson, Dillon, Teamey, Morris, Choi and Sanders (2004) suggested that residential Outdoor Learning programs provide links between the cognitive and emotional domains, allowing higher order learning.

Outdoor Learning has been shown to cultivate a stronger motivation to learn and a sense of ecological responsibility (Eick, 2012). It is the ideal environment for EfS teaching and learning as it exposes students to real life problems and the stakeholders involved. Being outdoors allows the students to experience an area with all of their senses and really connect to the environment (Nicol, 2004, p. 14). Becoming aware of the natural beauty of an area is the first step towards ecological responsibility, which is vital to sustainability literacy (Lugg, 2007). In order for students to establish an ethic of care for the environment the course must not be solely comprised of outdoor adventure activities – research has shown no links between outdoor adventure participation and an ethic of care for the environment (Rickinson *et al*, 2004). A teacher needs the knowledge and skills to facilitate EfS learning outdoors in order to foster a strong ethic of care within the students (Lugg, 2007). Outdoor Learning also allows teachers to incorporate human and non-human resources from within the local community, so that students can get a comprehensive understanding of the issue at hand (Gruenewald, 2003).

Despite its many benefits, there are a myriad of difficulties associated with implementing Outdoor Learning in Secondary schools in New Zealand.

2.8.3 Difficulties implementing Outdoor Learning

Outdoor Learning has traditionally been under-utilized in New Zealand (Zink & Boyes, 2006), and there are several reasons for this. Firstly, it is due to the attitudes of teachers: some view Outdoor Learning as detracting from core areas of importance such as numeracy and literacy (Edward-Jones, Waite & Passy 2018; McCrae, 1987). Other teachers are untrained and therefore unconfident at leading groups of students outdoors (Dillon, Morris, O'Donnell, Reid, Rickinson & Scott, 2005). Still more teachers have no interest in taking students outdoors because of their own preconceived notions of risk or the fact that they would have to step outside their comfort zone (Williams-Siegfredsen, 2007). Outdoor Learning opportunities require a lot of organization, which acts as an added barrier for teacher input given their already exhaustive workload (Zink & Boyes, 2006). Teachers are also under pressure from management to meet

achievement goals, and Outdoor Learning is not commonly seen as a way to meet such targets (Waite, 2011). Often Outdoor Learning costs more money, so this acts as an additional barrier for schools with minimum funding, especially in schools that serve low income families (Lugg & Martin, 2001; Rickinson *et al*. 2004).

2.8.4 Outdoor Learning and EfS

There is a natural synthesis between EfS and Outdoor Learning – in order to make EfS relevant some learning has to take place outside of the classroom. Therefore, in order for more EfS to take place, the barriers to Outdoor Learning need to be addressed. There are also strong links between Outdoor Learning and PRE. If Outdoor Learning can be seen as the setting for EfS, then PRE can be seen as the mechanism with which to foster an ethic of care for 'place' or 'environment'. PRE is detailed in the next section.

2.9 Place Responsive Education

PRE is relevant to my research because connecting with a place is vital to increasing sustainability literacy. PRE is based on the idea that developing a sense of place or connection to the landscape is essential in developing an ethic of care (Rose & Cachelin, 2014). In PRE a place is an area with meaning and a history of experiences associated with it (often overlapping due to its use by different individuals, groups and cultures) (Strang, 1997; Tuan, 1977). Norberg-Schulz (1980) theorized that the entire world is made of places, that even remote areas have inherent value despite their lack of use or cultural significance. Whilst this is an anthropocentric standpoint, it does prove a point: if people do not have a link with a place, they won't care about it. Hence, one of PRE's main goals is to establish relationships between people and places, so that we do care about them (Greenwood, 2013).

PRE developed in response to the neglect of local human and ecological communities within the curriculum and pedagogy of education. Philosophically speaking, PRE works on the premise that a sense of place, or identifying with a place is a basic human need, like food and water (Park, 1995). The philosophy is in keeping with the Māori belief that we must acknowledge our Turangawaewae, or the place we stand – for from that foundation everything else is built (Penetito, 2009). The idea of education for a

connection with place is not a new idea; indigenous peoples have educated their children in such a way for centuries (Penetito, 2009). There are strong links here to Socio-Cultural theory and EfS.

2.9.1 Pedagogy of PRE

PRE includes concepts of interdisciplinary learning and learning in context. It identifies strongly with both Social Constructivist and Socio-cultural learning theory. It places importance on a local curriculum that values local histories, cultures, stories. In essence it is the antithesis of standardization – PRE can be thought of as localization (Gruenewald, 2003). Local places, knowledge, culture and histories are sought out, valued, and integrated into the curriculum (Collins & O'Brien, 2011). In PRE, educators must make an effort to seek out and acknowledge all meanings associated with a place, for each individual needs to find something to identify with (Greenwood, 2013). By creating a relationship with a place, and holistically learning from its past we tend to appreciate it, care for it, and improve it (Stewart, 2008). To know the history of your place is to know your own history, and the place becomes part of your identity (Wattchow, 2005). The emphasis of PRE is on creating people who care about the world around them, and who are armed with the skills and confidence to make a difference (similar to EfS) (Leather & Nicholls, 2014; Smith, 2007). In PRE, teachers facilitate student projects, run skills-based workshops and foster links with individuals and groups in the community (Smith, 2002). Students don't sit at their desks listening to the teacher, they work collaboratively to engage in projects they are interested in, that actually relate to their lives (Smith, 2007).

2.9.2 Benefits of PRE

In PRE (just as in Outdoor Learning) students create knowledge, which is valued over the consumption of knowledge (Smith, 2002). This is a deliberate move away from consumerism, and teaches students to believe that they can contribute, not just consume (Smith, 2002). When practiced in conjunction with the state-mandated curriculum, PRE leads to a more place-sensitive curriculum – with the inclusion of local places, culture and knowledge within the curriculum (Payne & Wattchow,

2008). This approach has been shown to work in fostering stronger links with the place, increasing student engagement, and student achievement (Leather & Nicholls, 2014).

Case studies implementing PRE in schools across the world have noted similar benefits: students have developed more understanding and care for nature, scientific understandings, and improved their household environmental practices (or, in other words – their sustainability literacy) (Ballantyne & Packer, 2009; Gruenewald, 2003; Postma, 2006). Student achievement and engagement are improved, due to the fact that students choose projects that relate to them (Gruenewald, 2003; Mannion, Fenwick & Lynch, 2013). There are stronger and more collaborative relationships between students, teachers, and the community (Smith, 2004). In PRE the boundary between school, community and environment is permeable, due to the local content being studied (Smith, 2007). This allows students to feel more valued as contributing community members, and to enjoy the freedom of choosing their own path (Gruenewald, 2008).

Aside from the benefits to students, there are a multitude of benefits to the places themselves. Local places have been enhanced through students connecting with them, leading to increased biodiversity, cultural diversity, respect, acceptance, even a stronger economy (Mannion *et al*, 2013; Warren & Loeffler, 2000). The fact is that if people care about the area that they live in, they will create jobs to stay there (Smith, 2002). If people have been taught to recognize opportunities and are experienced at pursuing them (action competence), they will have little trouble transferring those skills to entrepreneurial ventures and being an active democratic citizen (Smith, 2007).

Even teachers prefer this method of education, citing improved job satisfaction and closer relationships with students as the leading benefits (Mannion *et al*, 2013; Smith, 2004). Most importantly, students gain self-belief that they can make a difference – which is sadly lacking in mainstream education, particularly in low income areas where a self-defeating attitude is prevalent (Smith, 2007).

2.9.3 Critique of PRE

Critics of PRE argue that ‘place’ as a concept is not important to all people, and that it is presumptuous to assume so (Greenwood, 2013). Today’s society cultivates

disconnectedness to place, so it is natural that some people do not value 'place' as a human need (Gruenewald, 2003). But we don't know what we don't know. If people were never introduced to, or given a chance to connect with, a place then are they really in a position to judge whether it is important or not? The same critics suggest that a focus on 'place' will lead to provincialism and a population ignorant of national and global issues (Gruenewald, 2003). In practice, this theory has very little merit (Greenwood, 2013). Because students involved in PRE become advocates for their own place, they naturally progress to becoming advocates for larger issues (Greenwood, 2013). A similar argument exists for the view that students in PRE would be unprepared for the workplace, as they had not learnt practical skills. A study by Leather and Nicholls (2014) showed that cultivating a sense of place and accumulating practical skills are not mutually exclusive; they are in fact mutually beneficial. Students learn the skills that are needed and valued within their community, and by doing so are more assured of employment (Smith, 2002).

There is concern that high-school age students are not mature, academic, or self-disciplined enough to work independently or be given the freedom of choice (Gruenewald, 2003). Quite the contrary, Senechal (2007) found that even the most disengaged students quickly came to life once given the opportunity to engage with a topic that had relevance to their immediate lives. Also, students are not alone; they work in collaborative groups and are helped by the teachers and members of the community (Smith, 2007). PRE challenges people's assumptions and ways of life; one of the principles of PRE is that the community should be self-sustainable and live within its means (Gruenewald, 2003). For many, this means the death of economic growth and a limitation on goods, and an end to consumerism (Gruenewald, 2003). It does not mean an end to growth; but an end to unchecked growth, and a beginning to smart and sustainable growth (Gruenewald, 2003). Finally, people have raised concern that teachers will direct the students towards their own aims, rather than letting them choose for themselves (Smith, 2004). Such a risk is real (Smith, 2004), but communities must place trust in teachers to be unbiased and working in the interest of their students. There should also be sufficient professional development available for teachers should they wish to incorporate PRE within their own practice. The major risk of PRE is that traditional subjects will not be taught to the same standard as before (Showalter, 2013). For

example, scholarship level algebra is unlikely to come into most students' projects, but remains a valid field of study for students at a higher level (Showalter, 2013). Essentially we have to ask ourselves, what purpose should education serve? What are our priorities?

For PRE to be used to its full potential it must be integrated fully into the school, the same as EfS (Smith, 2007). The planning and preconceived goals associated with our current methods of assessment are prohibitive to the PRE approach (Gruenewald, 2003). For responsiveness is not only in reference to the place in which learning occurs, but also to the students (Wattchow, 2005). PRE must therefore be multidisciplinary as well as experiential; the students and place should create the curriculum (Leather & Nicholls, 2014).

2.9.4 PRE and EfS

Many practitioners have melded critical pedagogy and PRE, to make significant changes to their communities (Gruenewald, 2008). Critical pedagogy challenges the status quo, and raises questions about nationalism, inequality, institutionalization, race and place (Burbules & Berk, 1999). In essence, critical pedagogy within PRE is very similar to the action competence arm of sustainability literacy within EfS. Because of this, a lot of the research that has been done in the synthesis of critical pedagogy and PRE can directly apply to my intervention which synthesizes PRE and EfS. When critical pedagogy is used alone it brings about change in communities, but tends to ignore the cultural knowledge associated with the area (Bowers, 1993). When melding the two approaches, educators first teach the students to love the place, then, when they are ready, they prompt analysis of the status quo (Mannion *et al*, 2013). Teachers must foster care and respect for an area within students before expecting them to identify problems and be personally involved in reaching solutions (Senechal, 2007). One of the great strengths of this combined approach is its ability to motivate disengaged minority students – which means that it is particularly effective in low-income areas (Senechal, 2007).

Like EfS, PRE is firstly concerned with creating an ethic of care amongst the students via putting them in a position where they can establish a connection to an area. Both approaches look at places from multiple viewpoints (political, economic, cultural, social, environmental) and encourage action competence through identifying issues and

following them through to practical actionable solutions. There is a significant link between EfS and PRE (and OL), as developing a deep sense of place is an essential part of developing an ethic of care for an environment (Rose & Cachelin, 2014). PRE also helps students to see themselves as a part of the world rather than apart from the world, one of the inherent goals within EfS (Rose & Cachelin, 2014).

PRE, EfS and OL have many links between them and it seems logical to synthesize the three approaches to make a stronger pedagogy (Cachelin, 2010; Woodhouse & Knapp, 2000). EfS provides a bigger picture and PRE imparts some of the steps towards reaching the goal, particularly in reference to the first stages of sustainability literacy where an ethic of care is developed. Outdoor Learning provides the place-specific pedagogy and IBE provides the context for the exploratory 'issue' recommended by PRE and EfS. I go into more detail about Issues-Based Education below.

2.10 Issues-based Education

Issues-Based Education is essentially the hook used to engage students in a meaningful context in which to learn sustainability literacy. IBE is an avenue of research that gives learning more application in real world contexts by focusing on a real issue, thereby allowing for more relevance and engagement (McConney, Oliver, Woods-McConney, Schibeci, & Maor, 2014). An issue is an important topic that is relevant, contentious, polarizing, controversial, current and most importantly provides the avenue for students to make an impact (Presley, Sickel, Muslu, Merle-Johnson, Witzig, Izci, & Sadler, 2013). In keeping with EfS and PRE, issues can be based on environmental, social, political, cultural or economic problems. Issues-Based Education is a curriculum with the goal in mind of fostering democratic citizens. In this way, IBE has a lot in common with Outdoor Learning as both are based on the work of Dewey (1903). It also has links to critical theory, particularly in the field of critical-sustainability (Lugg, 2007; Martin, 1999). There are strong links between IBE and the notion of action competence in that both recommend identifying an issue and following it through to action.

2.10.1 Pedagogy of IBE

The pedagogy associated with Issues-Based education is similar to that recommended for EfS (and for PRE). For this reason, it is useful to look at Issues-Based Education

literature to add to my theoretical standpoint. IBE places the school as part of the community rather than being apart from the community (Aikenhead, 2005). The role of the teacher is diverse. As a person, the teacher must be open, responsive, spontaneous and flexible. They must also be actively interested in current events and passionate and practiced in improving the current state of affairs (Penick, 1989). The teacher must also be skilled in facilitating impromptu Socratic seminars where ideas and values are extrapolated and discussed (Driver, Newton & Osbourne, 2000; Penick, 1989). Qualities such as creativity, observation, problem identification and networking are taught and valued (Dolan, Nicholls & Zeidler, 2009). Essentially, the teacher needs to be a facilitator of learning who leads by example. In other words, a social-constructivist.

Students are involved in curriculum design and look at issues of their choice within the community that affects them now and those that will affect them in the future (Hodson, 2003). This leans on the pedagogical foundation of social-constructivism and has commonalities with the other approaches described in this literature review. Students work collaboratively with the community, teachers and other students to discuss problems and how to solve them (Walker & Zeidler, 2007). Students seek and create information, and take action to solve problems. Students involved in IBE regularly engage in self-evaluation – which is based on progress, new ideas, and the action taken (Zeidler, Applebaum & Sadler, 2011). The teacher assesses progress by tracking changes in attitude, skills, concepts, creativity and application of knowledge (Yager & McCormack, 1989). Evidently, the pedagogical approach of IBE is similar to EfS, Outdoor Learning and PRE. There are many benefits to the IBE approach, many of which are shared with the other forms of education described in this literature review due to their commonalities.

2.10.2 Benefits of IBE

By getting involved in an issue, students are required to interact with the community so that they can understand the issue from a range of different perspectives (Aikenhead, 2005; Roth & Barton, 2004). This allows students to mature from these interactions and actually become an active part of the community (a democratic citizen). Focusing on an issue allows for learning to take place in an integrated multi-disciplinary manner rather than dividing knowledge up into distinct disciplines (Orr, 1991). By looking at the whole picture, students are able to gain a greater appreciation of the unity and links between

all subjects at school (Hodson, 2003). Tackling a real world issue fosters greater interest and curiosity in learning, and gives students a taste of different career paths (Unks, 1989). IBE encourages deep learning and studies have shown that students are more interested and engaged when they learn in this way (McConney *et al*, 2014).

2.10.3 Critique of IBE

Criticism of IBE is similar to that of EfS and PRE because it sacrifices breadth of knowledge for depth of learning (Penick, 1989). This can have an effect on students' foundational knowledge across a broad curriculum such as Science. However, this criticism has an inherent assumption that learning is in building blocks – you must learn one thing to learn the next. This is based on the relatively outdated Developmental learning theory which persists in some aspects of schooling (Fraser & McGee, 2012, p. 33-34). In reality, learning is much more related to engagement, interest and relevance (Paterson, O'Quin, Ceprano & Blue, 2003). Additionally, learning for breadth puts the teacher in the position of the keeper of knowledge, and the authority on what is relevant for other people. Compulsory learning for breadth is not the pedagogical position that I subscribe to and is the antithesis of democratic education. Education is moving away from this paradigm towards a more student centered approach such as that recommended by the NZC (Ministry of Education, 2007). Klosterman and Sadler (2010) found that students actually learnt more science-based knowledge when engaged in IBE, the caveat being that this knowledge was specific to their socio-scientific inquiry. McConney *et al* (2014) showed that students engaged in multi-disciplinary inquiry based learning tend to have less breadth of knowledge but an above-average interest in Science and an above-average engagement in Science. Surely that is more important.

Another potential pitfall of IBE (which actually applies to all methods of learning) is that if the teacher is unprepared and unstructured in their approach, then it will prove unsuccessful (Penick, 1989). This criticism (whilst unspecific) does raise an important point – instruction in IBE pedagogy within teacher training is not widespread. There is a need for professional development in the pedagogy of IBE within teacher training and with practicing teachers in order for it to be more readily and successfully adopted.

One of the challenges inherent in tackling 'issues' is dealing with the perceptions and opinions of adults – whether they be parents or community members (Presley *et al*,

2013). Controversial issues can divide a community and put students in real danger. For this reason, teachers must be careful to guide students towards actions that negotiate with and take into account the positions of all stakeholders (Zeidler *et al*, 2011).

2.10.4 IBE and EfS

There are multiple links to EfS within the pedagogy and philosophy of IBE as I have mentioned above. There are also parallels with PRE and Outdoor Learning. Hence, IBE has been included within the theoretical framework of this research – to utilize the natural parallels between these fields to form a cohesive and effective course for engaging students in EfS.

2.11 Thesis theoretical framework

Despite their different origins, there are a multitude of links between literature/research in the fields of EfS, PRE, IBE, and OL (Woodhouse & Knapp, 2000). All approaches share the same learning theory foundation of Social-constructivism mixed with Humanism and Socio-cultural ideas. Several studies have pointed to the potential synergy between the different approaches, commenting that they are complementary and that issues of social justice and Sustainability cannot be separated from one another (Cachelin, 2010; Lugg, 2007). The outdoors has been proposed as an ideal environment in which to model and facilitate social justice (Rose & Paisley, 2012). Any OL initiative would not be complete without acknowledging and fostering a sense of place (Liu, 2009). IBE is the hook that creates a relevant context. PRE helps to connect students with the 'place'. EfS provides the bigger picture of what we are trying to achieve and acts as the umbrella under which all forms of education can operate. All fields have an action-based component, with similar methods of fostering action competence. Essentially, the approaches are intertwined and complementary but in the past they have been taught separately and have been like a wheel with missing spokes – still fulfilling their role but not as well as they could. By integrating the different approaches, I am able to draw upon a larger body of research which makes my decision-making on course design more informed, and allows me to learn from more research. The synergy of these different approaches has been called for by many researchers, particularly in the nature of student interpretation of the

experience (Brookes, 1989; Nicol, 2004; Payne, 2015; Rickinson *et al*, 2004).

In the current educational climate within New Zealand there is no better time to trial such an approach. By combining these frameworks I am able to cater more directly to the NZC than the common transmissive pedagogical method employed in secondary schools in New Zealand. The vision of the NZC (Ministry of Education, 2007) calls for confident, connected, actively involved life-long learners. All of which are suggested benefits of these educational methods. The 'Curriculum Principles' in the NZC which "should underpin and guide the design, practice and evaluation of curriculum" (Ministry of Education, 2007, pg. 9) are also far better covered by adopting the approach described within this Literature Review. The 'Values' and 'Key Competencies' in the NZC (Ministry of Education, 2007, pp. 10-12) are all within the scope of EfS when combined with Outdoor Learning, PRE and IBE. These 'soft skills' at the front of the NZC (Ministry of Education, 2007) have historically been ignored in Secondary Education in New Zealand to the detriment of student learning and well-being (Soutter, O'steen & Gilmore, 2012). Schools are given the choice of modelling their school curriculum around values, key competencies or learning areas depending on the specific nature of the community. The school I am employed at has modelled their curriculum around the learning areas and essentially ignored the values and key competencies, which clashes with the ideals of EfS. The NZC (Ministry of Education, 2007) calls for interdisciplinary teaching that explores the links between different subject areas, it calls for research into future focused issues concerning Sustainability and citizenship, and it calls for EfS.

In this literature review I have outlined the fundamentals of learning theories pertinent to my personal pedagogy and the pedagogies of the forms of education used in my research. I have outlined the concepts of Engagement and Achievement and underlined the potential ways for education in New Zealand to improve in these respects. A description of the key frames of education in my study (EfS, OL, PRE & IBE) have been included, with an explanation of the pedagogy, benefits and challenges associated with each. I have discussed the links between these different frames of education and justified their use as part of my study. My personal pedagogy and the recommended pedagogy of each of the key frames of education have been synthesized to form my theoretical position. This in turn has informed my decision making towards my course design. I have also justified the purpose of

my thesis through identifying gaps in literature and practice within New Zealand.

In the next chapter I take the theoretical framework gleaned from this literature review and apply it to the planning of an intervention designed to explore my research questions. This will form the methodology for this piece of action research, designed in such a way that I can gain answers to my research questions in an ethical, reliable and valid manner.

3. Methodology

3.1 Chapter overview

This chapter describes the methodology of my research. Section 3.2 outlines my research questions that guided the research design discussed in this chapter and the empirical data collection reported in Chapter 4: Findings. Section 3.3 explains the methodological framework that I have drawn on throughout this research. Section 3.4 gives a review of the methods that I used to collect the data used to answer my research questions. Section 3.5 is an explanation of the intervention that I designed with the theoretical framework in mind and a detailed account of how I processed data gathered. In section 3.6 I examine the credibility of my data – did I measure what I set out to measure? Then in section 3.7 I discuss the reliability of my data – could my study be repeated and get the same findings? Section 3.8 describes the processes put in place to ensure that every part of my research was ethical and minimized harm. Lastly, I summarize the chapter in section 3.9.

3.2 Research Questions

1. What are the student experiences of a school camp based on PRE, IBE, Outdoor Learning and EfS principles?
2. How does an issues based, outdoor camp based on EfS and PRE principles affect the sustainability literacy of student participants?
3. What is the contribution of an issues based, outdoor camp based on EfS and PRE principles to student achievement?

3.3 Research Methodology

As part of my research methodology it is important that I am transparent about my Ontology, Epistemology and Axiology. That way it is clear where I am coming from as a researcher and the reader is aware of any biases or mitigating factors that may be present in the collection, analysis and reporting of my research.

3.3.1 Ontology, epistemology and axiology

Ontology

Ontology can be defined as the nature of reality (Crotty, 1998, p. 10). Ontology can be further defined into philosophical ontology and non philosophical ontology (Lofgren, 2013). Philosophical ontology involves contemplating what is real/not real/more real/less real. Philosophical ontology can be further broken down into ontological materialism (the idea that reality exists despite human observers) and ontological idealism (the idea that physical reality is constructed in the mind of the observer). From a non-philosophical perspective, ontology concerns specifically what exists and the relationships/hierarchies between the different parts. There is also Social Ontology which is used to describe society and its different parts and processes with the purpose of identifying underlying structures that affect individuals and groups.

So, for the purpose of this research, Ontology (or the nature of reality) ranges from what we were doing (activities) down to the finer details such as which language was being used (Dillon & Wals, 2006), the relationships between different individuals/groups, and individual thoughts and feelings.

The ontological position in this research

The nature of reality in this research is that everything is equally real (objects, actions, feelings) and important. That things exist whether the observer is there or not i.e. object permanence (including objects, people and the interactions between them). Because I was the observer in this research this means that I accept that life was happening around me without me but that when I was there my presence did have an effect on what was being observed. This is known in Physics as the observer effect, and in psychology as the Hawthorne effect (Adair, 1984; Healy, 2007). This implies that particles and humans both react and act differently when they are being observed (whether actively or passively).

As well as my observation affecting the nature of reality, my own personal reality affected the nature of reality. This is called the observer-expectancy effect and is a result of the cognitive bias of the observer influencing the behavior of participants (Allen, 2015). For example, my presence may have influenced the behavior of the participants because they knew what I was studying (sustainability literacy,

engagement, enjoyment, knowledge development) which may have affected the way that they behaved around me, in an attempt to please the teacher. The observer-expectancy effect also states that the observer tends to (consciously or subconsciously) observe the elements which cater to their own personal bias (Allen, 2015). In this instance it means that I may have unwittingly observed students involved in actions that confirmed my own goals for the research (and recorded it as such) and ignored actions that did not cater to my own preconceived intentions.

Epistemology

Epistemology refers to the ways in which the nature of reality is understood as knowledge (Lofgren, 2013). Knowledge itself can be defined as a justified true belief. If knowledge cannot be justified, if it is not believed, or if it is not true to begin with, then it does not count as knowledge. Knowledge itself stems from experiences that affect our thought processes. There are two branches of thought with different views on how knowledge is defined as true or not. These are Empiricism and Rationalism. Empiricism essentially states that we can only truly rely on our own sensory experience to tell us whether something is true or not – until then it will subconsciously remain undecided and cannot be trusted as knowledge. Rationalism stems from the belief that the decision as to whether something is true or not must be decided by logic and reason (Guba & Lincoln, 1994, p.108).

Examples of the way that reality is synthesized into knowledge are tests, observations, surveys and so on. Because many of these forms of understanding are qualitative, they are influenced by the relationship between participant and researcher. For this reason, it is important that the researcher breaks down the barrier between themselves and the participants so that participants behave in a natural way and that data gained can therefore be more dependable. However, for the reasons stated above (observer effect and observer-expectancy effect) any knowledge created must be viewed skeptically (particularly participant observations).

The Epistemological position in this research

Within my research, reality was synthesized into knowledge via participant observations, focus group interviews, student assignments and questionnaires. Each

of these components allowed me to make a judgment as to the nature of reality for the participants. In order to classify any information as 'knowledge' it must have been able to be verified with high quality evidence. That is why I gathered knowledge in multiple forms – one form of knowledge can be used to corroborate another and act as evidence that it is a fair approximate of reality. This is the rationalist way of discerning true knowledge from untrue (or not as true). The more that knowledge is repeated in different forms of knowledge gathering, the truer it can be deemed to be. From an Empiricist point of view, in order to be justified as being true knowledge, students must have experienced it. In other words, if students comment on something that they have not experienced then it cannot be deemed as true knowledge.

This influenced my data gathering methods as I could not reasonably ask or expect students to have knowledge about something that they had not experienced. When I asked students questions at the start of the intervention to get their preconceived ideas surrounding the issue of mining in Karangahake, students had no experience of the issue and therefore their answers can be deemed less 'true'. By this logic, the answers given in the post questionnaire and focus group interviews are more true because they are given by the students after the intervention. By this logic, the words spoken by students in the focus group interviews are the 'truest' knowledge, because students have been on the intervention and their experience is related in their own words. The next 'truest' form of knowledge is the post questionnaire because students had seen the questions before and knew what I was measuring (and so likely acted differently), followed by the observations which are the least true form of knowledge (due to the observer effect and observer-expectancy effect described earlier).

Axiology

Axiology is the philosophical study of value which determines what is good or right in an action or object (Cohen, Manion, Morrison, & Bell, 2011, p. 3). When applied to material objects, Axiology is represented as Aesthetics, when applied to actions Axiology is represented as Ethics. Ethics can simply be defined as determining whether actions are right or wrong. In Educational Philosophy, Axiology is used to describe the values inherent to a particular being or object. These values can be categorized into Primal (for example, food and water) and Secondary values (such

as valuing privacy).

For the purpose of this research I will only be discussing Axiology as it applies to Ethics and Educational Philosophy.

The axiological position in this research

An axiological position is to do with ethical considerations thought about by the researcher, and requires me to acknowledge my own bias in gathering evidence. I have to acknowledge my own set of values and consider how these might shape my approach. This leads directly to the Educational Philosophy version of Axiology – what do I value?

It is impossible for me to list all of the things that make me who I am, I can only generalize and give a glimpse of factors that may influence my bias and values position. I am a 31-year-old, middle class Pākehā male with a passion for the outdoors and ecological sustainability. I have travelled a lot. I have a tendency to vote for left wing political parties. I am idealistic and driven to improve the education system in New Zealand. I strongly believe in equality for all genders, races and cultures. I think that Te Reo should be compulsory in New Zealand schools. I am a Science/Biology teacher which means that I tend to see things from a Scientific/critical point of view. Having said that I'm open minded to ideas which have no scientific proof – sometimes it takes a while for Science to catch up. I value interpersonal relationships, the outdoors, freedom, democracy and equality. My bias is that I am coming from a position where I have a vested interest in my intervention 'succeeding' in creating an enjoyable, engaging student experience that raises sustainability literacy.

3.4 Research Paradigm: Interpretivism

A paradigm can be defined as "a way of looking at or researching phenomena" (Kuhn, 1962, pg. 23). Choosing the right paradigm is vital, it should relate directly to the focus of the enquiry (Maxwell, 2005). The paradigm that best fits my research focus is Interpretivism. Cohen *et al* (2011, p. 17) describe Interpretivism as a paradigm that strives to "understand and interpret the world in terms of its actors, meanings and interpretations". This view assumes that peoples' actions are deliberate, that people construct their own view of the world, that situations are fluid and changing and that multiple interpretations are likely, and that it is the

participants' view of their experiences that is important (Cohen *et al*, 2011, pg.18). Interpretivism differs significantly from positivism in that it has a subjective rather than an objective view of the world.

In the section 'Ontological position in this research' (page 38) I accepted that the world continues to operate without me and that when I am present, I, as the observer, will be affecting the experiment simply by being there. This fits in well with Interpretivism as I am trying to ascertain student experience in relation to my pedagogy as part of the research.

In the epistemological approach used in this research I am viewing student experiences as valid and true knowledge – which is what Interpretivism looks for and values. I have also acknowledged that I will unconsciously filter my observations through my inherent biases which were outlined in 'The axiological position taken in this research'. These biases may cause my observation data to be compromised, which is why I am gathering information in three separate ways – to triangulate the data and minimize the observer effect and observer expectancy effect.

My adherence to the Interpretivist approach can be seen in my research questions and in my methods of gathering data (focus group interviews, questionnaires and participant observations) – I am interested in the participants' perceptions, opinions, values and feelings. I have followed this Interpretivist approach down to the finest details such as the wording and context of each question within my questionnaire and interviews. I was careful to word questions in such a way that they teased out student opinions and feelings.

3.4.1 Critique of Interpretivism

A criticism of interpretive approaches to educational research is that they are so centered on the individuals and negotiated meanings that they can ignore the power relationships within which the context is set (Cohen *et al*., 2011, p. 21). This can result in artificial boundaries being set and a concentration on micro-sociological perspectives (Cohen *et al*., 2011, p. 21). This leads to the study being very unique and unable to be repeated. I would argue that any experience is exclusive and can

never truly be repeated, to try to replicate an intervention such as mine for the purpose of checking validity would be an exercise in futility. One cannot control all aspects and variables that lead to human experience (Gadamer, 1975). There will always be an issue of power relationships, which is why I have been clear about my Axiology, Ontology and Epistemology as well as having a thorough methodology to make such relationships transparent.

3.5 Methodological approach: Action Research

Choosing an appropriate methodology is vital to the structure of any research (Guba & Lincoln, 1994). Methodology can be defined as a different style, or different approach to research in order to fit the context (Cohen *et al,* 2011, p. 217). The methodology most appropriate to my focus question was Action Research.
There is a wide range of methodologies to choose from, and many overlaps between them, which made it difficult to choose one method. I have chosen to use Action Research methodology because it is the best fit for my research, particularly because I have taken an Interpretivist position (Carr, 2006).

What is Action research?

Dewey defined Action Research as a practical manifestation of experimental thinking (Dewey, 1929). He claimed that it was emancipatory in that ideas could be put to the test without having to rely on prior knowledge or theoretical hubris. In this way, Action Research is a freeing way of doing research as it allows the researcher to put thought into action, reflect on the results and improve the process. This reflective methodology is akin to the modern inquiry learning model. Action Research attempts to understand existing phenomena in context, without attempting to create universal knowledge (Rapoport, 1970). The knowledge created through my research is predominantly for the purpose of informing my own practice, with the idea in mind of improving the pedagogical approach of EfS within my own school. Critical to Action Research is the desire to improve current practice (Nolen & Vander Putten, 2007), as such - it is the perfect fit for my research. My research can have wider implications, although due to the subjective nature of my study any conclusions must be viewed cautiously. Action research leaves the analysis up to the reader (Efron & Ravid, 2013).

Action research should not only aim to answer the research question but to follow through on the practical solution (hence: action). In my context, this practical solution is the improvement of the current pedagogy and curriculum within my classroom/department/school in order to create a more holistically rich learning environment for children and to foster sustainability literacy/action competence so that students are empowered and supported to improve the environment (in the holistic sense of the word). This improvement aspect of my research fits well with Kemmis' (2010, p. 4) idea that Action Research should aim *"*not just at achieving knowledge of the world, but at achieving a better world". Because I am engaged in Action Research I am obliged to inform the community of the results of my research and work with them to solve the problem (in this case, lack of sustainability literacy and engagement). This aspect of Action Research will be met via the publishing of my research, potential papers written from my research, speaking at conferences and holding professional development sessions at my school (and maybe others).

3.5.1 Critique of Action Research

The main problem with Action Research is that it is difficult to apply the findings to a wider field, because the findings are extremely contextual (Coughlan & Coghlan, 2002). This criticism actually helps to underline the main strength of Action Research: The immediate practical relevance to the local setting. Critics have potentially overlooked the fact that in education especially there are too many factors to control for anything to be valid on a large scale. But a local study can serve to inform local decision making, as the factors affecting the study are unique to that context. Some critics have accused Action Research of being unscientific, that its results are not valid and not to be relied upon as an accurate representation of facts (Onwuegbuzie & Leech, 2007; Toulmin, 1996). This places the field of Action Research in a difficult position, it not only has to be valid in itself, but it also has to convince others of its validity (Helskog, 2014).

Something can be valid within itself but rejected by the wider community – take Darwin's theory of Natural Selection as an example. The origin of this lack of trust in Action Research lies in the fact that it sets out to improve practice, not to test theory – the typical domain of scientific research (Toulmin, 1996). This has caused researchers from other fields of research (outside of education) to be dubious as to

the validity of Action Research. I can understand their point of view, when one piece of Action Research is looked at in isolation it is unscientific to apply the lessons learnt to the wider field of research – it only relates to the local context. Conversely, in traditional scientific research it is often possible to control all variables and construct an easily repeatable and verifiable experiment – so that one piece of research can stand alone as being valid, but in isolation of other factors often doesn't provide a useful picture.

The validity of Action Research comes in numbers. When Action Research across a multitude of studies within the same area (EfS) show the same or similar trends we are able to start to trust Action Research as it applies to the wider field of research. That is why adding to the body of knowledge is so important. More practitioners publishing Action Research equals more validity for the field of research. Essentially, Action Research is no less valid than traditional empirically based scientific research – it's just that the method of checking validity is different. The consequences of this are that emerging fields of research with small bodies of knowledge take longer to become accepted, which can be frustrating for practitioners who are confident that their results are valid. There are positive aspects to this waiting period - because the early Action Research within an emerging field is not considered valid, people will be hesitant to use it, which avoids the use of potentially invalid theory and the spread of misinformation.

Within my field of research (the best practical way of embedding sustainability literacy in a New Zealand secondary school setting), there is not a large body of knowledge, therefore my research may not be considered as valid as if I was contributing to a larger and more established body of work (particularly if my results were similar to those found already).

Ethical issues in Action Research

The major ethical issue associated with Action Research in the field of Education is around consent. Individuals must consent to being involved in research and in most cases, students are under the age of consent, so their parents must give consent for them. The problem with this is that parents may not listen to their children and sign one way or another against the participants' will (Brydon-Miller, 2008, p. 563).

The other inherent problem here is that because the researcher is a teacher with whom they either have contact or are very likely to come into contact with, students are consciously or unconsciously aware of a power relationship (Nolen & Van der Putten, 2007). The teacher is seen to be in the position of power because they are the ones who design the courses, decide which students get into which courses and grade the papers. So it is natural for students to want to please the teacher so that they remain on their good side. Also, if the prior teacher/student relationship is poor, the student is unlikely to elect into a course run by that teacher. This is an ethical pitfall of Action Research (Nolen & Van der Putten, 2007). To address this issue I made sure that my informed consent letters thoroughly explained the nature of the research and required both a student and a parent signature. I also discussed with students the voluntary nature of the study and gave them the option of pulling out any time prior to the intervention. I was explicit in informing the participants that there were no consequences for choosing not to be involved in the study. Critics of Action Research advise against practitioner research because of the inherent bias and complex prior relationships, but these are compensated for by the benefits of teachers being able to improve their practice (Kemmis, 2006; McBee, 2004; McTaggart, 1994).

3.6 Research design

Overall picture

In December of 2017 I facilitated 13 students on a 10-day camp. The camp was located at Dickies flat within the Karangahake area – a Department of Conservation (DoC) area which is at the eastern edge of the Kaimai Mamaku ranges, New Zealand. The camp was created around 'best practice' for the cultivation of sustainability literacy. I drew advice from the fields of EfS, PRE, Outdoor Learning, and IBE. My aim was to create a camp that would engage students in an EfS issue whilst integrating relevant NCEA achievement standards. This fits with the intended purpose of EfS – to be used in a multidisciplinary fashion that enhances and contextualizes learning so that it is more meaningful. To design the camp (location, activities and so on) I consulted with the students over the course of six months. In this way students were involved in nearly all aspects of planning for the camp. All decisions were democratic and made by a majority rule.

Our first two days were spent at school, where students were introduced to the area and provided with some history. We then looked at the issue (mining) and the students were exposed to the viewpoints of multiple groups on both sides of the issue (stakeholders). Students were then given tasks in which they had to take on the opinion of different groups so that they could understand the issue from both sides. Students were then encouraged to extrapolate on the pros and cons of mining in terms of social, political, environmental, economic and cultural aspects. Lastly, students were asked to envision what each stakeholder would want for the future of the area and why (futures approach). After some learning about the area, students provided their baseline opinions, clarified their values positions and established their base knowledge through a questionnaire. I could not expect the students to provide baseline data without some learning around Sustainability, the issue being investigated and the environment which we would be operating in. As I mentioned in the section 'Epistemological position in this research', knowledge can only be considered true if it has been experienced. So, despite the students not having experienced the issue or area I wished to at least to provide them with some knowledge to base their opinions on.

We then moved to the location of Dickies flat where we would remain for the next 8 days, being visited (and visiting) four stakeholders over the course of the camp. These stakeholders were from the mining company (New Talisman), the Department of Conservation (DoC), the local iwi (Ngati Tamatera), and the group 'Protect Karangahake'. Students spent the first two days at camp 'acclimatizing' to the environment. In this time, we explored the area in order for students to gain experience and confidence, as well as develop a love for the area. Exploratory activities included climbing Mt Karangahake, visiting old mining sites, swimming, hiking and so on. I also held a few workshops on river crossing and hiking technique once the students realized that they needed it. After this 'acclimatization' period we spent two days in an investigation period conducting ecosystem health surveys, which involved students surveying the biotic and abiotic conditions at three stream sites (forest, farm, mine). This investigation period was included for a multitude of reasons, so that students could critically evaluate the effect of different land uses on stream ecosystem health, to provide evidence upon which to base an opinion or action, to learn to work in a team and much more. The next period of the camp can be considered the consolidation period – it is the part where students had the

opportunity to explore the environment through a different lens as they had accumulated a lot of knowledge in the past few days. The seventh day and the morning of the eighth day were spent hiking up to a DoC hut (previously a logging base) for an overnight stay. Again, there were many reasons for this, to foster a love for the environment, to learn the role of DoC, to appreciate the history of the area and so on. The eighth and ninth day were spent at our base camp (Dickies Flat) completing the written aspects of the achievement standards. During this time, students were self managing – they had resources on offer and had been given a structure to follow. I was available for questions and I took the role of facilitator – discussing issues with students so that they could come to a better understanding but never giving away the answer/information. On the tenth and final day students re-examined their original values and completed their post-questionnaire, and focus group interviews were conducted. We discussed potential actions that could be taken from the work that we had completed and they came to the decision that we needed to do further/repeated studies of the waterways above and below the mining input before the data would be valid enough to be taken seriously. They also identified that a submission of our data and conclusions to the council, mining company and local organizations would be the best course of action. We packed up, had lunch together on the beach, then headed back to school to say our goodbyes.

Context

The overarching theme was Sustainability, the issue that we focussed on was mining in the Karangahake Gorge. Specifically: How was exploratory mining in Karangahake Gorge affecting the freshwater ecosystem? Karangahake Gorge is a conservation area (part of the Kaimai Mamaku Forest Park) managed by the Department of Conservation in the Bay of Plenty. It is a large, deep and narrow gorge between Waihi and Paeroa, that is one of the main routes for traffic to and from Auckland as well as being a highly touristic area filled with walks, campgrounds and swimming holes. Karangahake has recently (2017) been reopened to exploratory mining which is by far the largest anthropological impact upon this environment as well as a highly controversial issue. Historical mining in the area caused widespread ecological damage and local sentiment is strongly against any further mining. This sentiment is seen as you drive through the area – there are ‘no mining’ signs and information boards informing people as to what is going on. There have been numerous protests, marches, ‘yarn bombings’ and

submissions to council in an effort to prevent mining (Balvert, 2014; Manch, 2017; Wood 2017). The local iwi is also against the mining and have been active in protesting and letting the local government know their stance on the issue. Permission to mine in the area has been granted by the Hauraki District Council to New Talisman Gold without any public consultation (Thomas, 2015).

As a comparative study, we surveyed the effect of 'natural' environments (long forested stretches of stream with no human-made structures or modifications present) and agricultural land use (cattle farming) on stream health. These additional sites allowed us to compare the stream ecosystem health downstream from mining with an area that should have had better 'health' (the natural environment) and with the agricultural area to see if farming or mining had a detrimental impact on ecosystem health.

Participants

The 13 participants on the intervention were all members of the same form class at a public, co-education, decile 6 school in New Zealand. At the time of the study they were in Year 10 at school (either 14 or 15 years of age). I was the form teacher for the students in the two years preceding the study, meaning that they saw me three mornings a week for 15 minutes in which we completed administration tasks and played games. In the year prior to the study (when the students were in Year 9), I was their Science teacher for four hours a week. Despite having established relationships with the participants in a school setting, prior to the intervention I did not know them well. In a school setting it is difficult to get to know students, there are added pressures and stresses combined with cultural, social and behavioral expectations that affect students and teachers' ways of being.

The students were not chosen individually, they self-selected to be part of the intervention. Although I offered it first to my form class of 27 individuals – I would have spread my net wider if I did not gain sufficient interest from within my own class. I approached the class midway through the school year and pitched the idea to them – of a longer than usual (10 days vs. the usual 3) end of year camp based on the context of Sustainability where they could be involved in the planning and could gain some NCEA experience. I distributed written information for students to consider and those who were interested started to contribute to weekly planning

sessions.

Initially, the idea was to get at least 20 students involved in the intervention so that my data may have some statistical significance. The problem with getting 20 students comes down to health and safety ratios in the outdoors: around water I am required by my school to have a ratio of one adult to every four students. With 20 students this would mean five adults – I could not get any parents willing to take this much time off work or get allowances from school to take so many teachers as it would short-staff them. There was also the problem of finding willing teachers to come on the camp. Ten days of full time supervision is quite a commitment. Luckily, I found two willing teachers who were fantastic education professionals, experienced outdoor enthusiasts and passionate environmentalists.

Within our weekly planning sessions, we collaborated on the location of our camp, the guest speakers, the activities within the camp and other minutiae. I informed the students as to the nature of the achievement standards that would fit within the context, and fully disclosed what I was studying/measuring and why. Students were able to ask questions and converse with me about all aspects of the camp. Once the planning was complete and my research ethics were approved, informed consent forms were sent home and I held a meeting at school to speak with/inform the parents about the camp.

In the end, 13 was an appropriate number of participants for the nature of my intervention. Any more or less and it would have changed the dynamics of the group – 13 was a very manageable number.

Pedagogy

I intentionally tried to stay true to the EfS Pedagogy that I outlined in Chapter 2. Whilst on the intervention I took a support role and acted as a facilitator of learning. I wanted the learning to flow through the students' natural interest and inquisitiveness. I was simply providing rich experiences that would hopefully stimulate engagement with the issue that we were investigating. There was knowledge that needed to be learnt in order to pass the NCEA achievement standard but it was not forced upon the students. Learning occurred when it was needed by the students and instruction happened when it was asked for, but my method of instruction was not transmissive. I would try to get students to draw on their own

prior knowledge and observations first, then ask questions that would lead their thinking down a productive path. I was always available to converse with students should they want to know anything. For this reason, I had to make sure that I was personally knowledgeable on the topic and that I had some physical resources available should students require them. Links between key learning activities on camp and my theoretical framework are shown below in *Figure 3.1*.

Day	Location	Key Activities	Justification in relation to my theoretical framework
0	School	**Preparation period** 1. Co-construction of camp with students (Location, issue, activities, camp minutiae)	1: Students have a voice in their education, increases engagement. (EfS)
1	School	**Introduction period** 1. Introduce students to key ideas of Sustainability. 2. Looking into history of Karangahake gorge. (Tui mine as case study) 3. Introduce students to mining issue – looking at news articles, videos etc. 4. Introduce students to stakeholders.	1: Clarifies thoughts around definition of Sustainability. (EfS) 2: Students objectively learn about the area prior to the camp. (IBE) 3: Students are 'hooked' into issue. (IBE) 4: Students see issue from multiple viewpoints. (EfS)
2	School	**Introduction period** 1. Stakeholders role-play 2. Futures approach 3. Values clarification on mining issue – students to write an opinion piece on mining in the Karangahake valley. 4. Pre-intervention Questionnaire.	1: Increased knowledge of issue and empathy with stakeholders. (EfS/IBE) 2: Increased understanding of cause and effect, wants and needs of stakeholders. (EfS/ IBE) 3: Provides a baseline for student values, thoughts and feelings. (EfS) 4: Provides a baseline set of data on sustainability literacy.
3	Dickies flat	**Acclimatization period** 1. Hike along 'Windows walk'. 2. Swim at swimming hole.	1 & 2: Students learn about history of the area, aids in sustainability literacy, understanding of issue and fosters sense of 'place'. (PRE/ EfS/ IBE/ OL)
4	Dickies flat	**Acclimatization period** 1. Hike up Mt Karangahake. 2. Trip to Waihi goldmine. 3. River crossing technique 4. Swim at swimming hole	1: Students learn about history of the area, aids in sustainability literacy, understanding of issue and fosters sense of 'place'. (PRE/ EfS/ IBE/ OL) 2: Students see issue from stakeholders' point of view, helps establish sustainability literacy & understanding of issue. (EfS/ IBE) 3: Allows students to feel more comfortable in environment and more

			likely to engage with issue. (PRE/ OL) 4: Fosters sense of place via enjoyment and creation of personal stories. (PRE)
5	Dickies flat	**Investigation period** 1. Freshwater ecology with DoC representative. 2. Stream health survey techniques. 3. Stream health survey 1. **4.** Swim at swimming hole.	1: Increased understanding of issue via meeting stakeholder. (EfS/IBE) 2: Developing action competent skills relevant to investigation. (EfS/ IBE/ OL) 3: Exercising action competence, developing investigation skills. (EfS/ IBE/ OL) 4: Connecting to place. (PRE)
6	Dickies flat	**Investigation period** 1. Stream health survey 2 & 3. 2. Meeting with local iwi.	1: Exercising action competence, developing investigation skills, understanding complexity of stream ecology. (EfS/ IBE/ OL) 2:Increased understanding of issue via meeting stakeholder. (EfS/ IBE)
7	Overnight hike	**Consolidation period** 1. Overnight hike to DoC hut (previously logging base). 2. Exploration of old logging facilities.	1: Understand how to behave within the environment in a sustainable manner. Develop connection to place. View environment through new lens. (EfS/ PRE/ OL) 2: Appreciate history of area, further develops sense of place and sustainability literacy. (EfS/ PRE/ OL)
8	Overnight hike	**Consolidation period** 1. Stream health survey of 'pristine' waterway. 2. Return hike. 3. Flexible work on Assessments.	1: Apply action competence skills, increase understanding of issue. (EfS/ IBE/ OL) 2: Fosters interpersonal relationships. (PRE/ OL) 3: Places trust in students, increases engagement and consolidates knowledge. (EfS)
9	Dickies flat	**Consolidation period** 1. Flexible work on assessments. 2. Swim at swimming hole.	1: Places trust in students, fosters initiative, consolidates knowledge. (EfS) 2: Further develops sense of place and creation of place based stories leading to ethic of care. (PRE)
10	Dickies flat	**Consolidation period** 1. Discussion of action to take 2. Re-examining of original values	1: Develops action competence, reduces feelings of despondency. (EfS/ IBE)

		3. Post Questionnaire 4. Focus Group Interviews 5. Shared Lunch	2: Metacognition. Reflection. (EfS/ IBE) 3: Consolidation of knowledge, opinions, values. Reflection. Metacognition. (EfS) 4: Consolidation of student experience, reflection. (PRE/ OL/ EfS) 5: Consolidation of interpersonal relationships, reflection on experience. (PRE/ OL/ EfS)

Figure 3.1. Table of activities with links to the theoretical framework.

3.7 Data Methods

Data methods are the way in which knowledge is generated in research. Choosing which data methods to use required a deliberate process of finding the methods that were the most fit for purpose (Cohen *et al*, 2011, p.375). For data methods to be fit for purpose they had to fit with the research paradigm (Interpretivism) and the methodological approach (Action Research) as well as being able to answer my research questions.

The data methods that I chose to utilize were Questionnaires, Focus Group Interviews and Participant observations. I chose these 3 methods of data collection for multiple reasons. I wanted to triangulate my data so that I could increase the validity of my findings and I wanted to give students different ways of expressing their experience on camp to avoid various pitfalls associated with using only one data collection method.

As well as these data collection methods I also looked at student assessments and assessment grades once they had gone through the marking process. With all of these data methods combined I was able to get a good idea of student experience on camp and answer my research questions.

3.7.1 Questionnaires

Rationale

Questionnaires were selected as a data collection method because they are an

effective way of gauging the change in attitudes, values, knowledge and understandings of a large number of individuals when utilized as a pre/post survey (Wilson & McLean, 1994). I needed multiple ways of gathering data on student experience and I knew that questionnaires would allow me to gather structured responses that could easily be turned into numerical data (quantifiable). In contrast, the other data methods selected (focus group interviews and participant observations) were much more influenced by bias and provided data that was more difficult to analyze given the range of responses. The major downside of choosing to use questionnaires as a data collection method was the time that it took to develop, pilot and improve questions. I acknowledge that questionnaires give a relatively limited scope of data but this was balanced out by the wide range of data provided by the focus group interviews and participant observations (Cohen *et al*, 2011, p. 377).

Design

As recommended by Wilson and McLean (1994, p. 8-9), I designed the context of the questions so that they would effectively help to answer my research questions (see Appendix A). I had to plan my questions so that they would provide me with the most appropriate kind of data which could be easily analyzed. To improve the ease of detection of changes in opinion, values, knowledge and understandings I utilized a ratings scale called Semantic Differentials rather than give space for students to write their own answers. Semantic Differentials were first established by Osgood, Suci and Tannenbaum (1957) with the intention of improving upon the data produced by Likert scales. The benefit of utilizing Semantic Differentials is that students' answers were somewhat standardized and quantifiable, which made them far easier to process and consequently made it easier to determine trends in the data. Semantic Differentials are a scale with polarizing statements at opposite ends of the scale, which were given the numbers 1 and 5. I used five numbers so that the scale was balanced with two positive, two negative and one neutral option, as this makes the questionnaire neutral itself (Friedman & Amoo, 1999, p. 119). As recommended by Hartley and Betts (2010), Position 3 was labelled as a neutral position and 2 and 4 were labelled as moderate agreements towards the polarizing statements located at 1 and 5. For example, in question 5 of my questionnaire, there were two statements: at location 1- I can make a difference in the world by taking action on Sustainability issues, and at location 5 - Any action I take for a Sustainable

future will not make any difference. The answer that would fit best with sustainability literacy was that at location 1. The reason for labelling each number is so that participants are better able to define the answer which applies to them, which increases the validity of the data (Hartley & Betts, 2010).

In order to improve validity I changed the location of the most sustainable answer for some questions – otherwise students may figure out a pattern which could influence their answers (Friedman & Amoo, 1999, p. 115). As I used Semantic Differentials with fixed answers there was no room for ambiguity in answers. The statements were written to be definitive and closed in nature so that responses could not be misinterpreted. Parts of the questions that required prior knowledge such as 'sustainable future' were explained beforehand so that all students' responses were enhanced for validity. The downside of asking closed questions with predetermined responses was that I could not get a large variety of responses, however this was addressed in conducting focus group interviews where students were able to express themselves. This allowed me to triangulate data and gain a fuller picture of the impact of my intervention. The order of my questions was another aspect of the questionnaire that had to be carefully considered. Essentially students needed a few 'warm up' questions so that they could fully engage with the more cognitively demanding nature of the following questions. I also tried to mix up the nature/context of the questions, for example, I did not put all my questions about mining knowledge together.

I had to be careful in wording my questions so that students were able to understand what was being asked without further explanation and that the students' interpretation of the wording matched mine. The wording had to be in a language and vocabulary that was accessible to the literacy level and culture of the students to avoid any potential confusion (Cohen *et* al, 2011, p.379).

To refine my questions a pilot questionnaire was given to a group of 5 students. The pilot questionnaire was evaluated by the students for its ease of understanding – both of the questions and the structure of the questionnaire. Feedback was then used to improve the questionnaire – with several statements rephrased to make them more readily understandable.

Critique

Critics of Questionnaires and Semantic Differentials point out that a lot of emphasis is put on the individuals choosing a number – and people can be inconsistent, lazy or careless when doing so (for example, choosing 3 for every answer so that they can complete the survey quickly) (Cohen *et al*, 2011, p. 388). Also, students can view questionnaires as a test and hence become hesitant and guarded within their responses (Oliver, 2003). There is no way of determining whether the respondents took their time and considered each answer carefully, or to determine which questions were answered carefully and which were not. In order to mitigate this issue, I let students know that they had as much time as they needed to complete the questionnaire thoroughly and made sure that there were no other looming commitments that students would be rushing towards (such as lunch time dance practices). Another problem is that some respondents may say one thing in a survey and do another in real life, hence it may not be a true reflection of their position (Cohen *et al*, 2011, pg.388). For this reason, I had several ways of gathering data (questionnaire, focus group interviews, participant observations) so that I could potentially explore irregularities between responses and actions.

A disadvantage of having a numerically based scale (for Semantic Differentials) is that there is no definitive graduation between responses (Cohen *et al*, 2011, p. 387). For example, the difference in meaning between the responses 2 and a 3 is not the same difference in meaning between a 4 and a 5. For this reason, any averages of responses need to be viewed with a level of scrutiny (Friedman & Amoo, 1999). Research has also shown that participants tend to avoid the extreme ends of the scale, rendering a three-point scale relatively benign (Cohen *et al,* 2011 p. 389). For this reason, I utilized a 5-point scale, as recommended by Friedman and Amoo (1999, p. 120). I did not use a 7-point scale because I was more interested in seeing if student responses moved from one pole to the other than determining their movements within a pole.

3.7.2 Participant observations

Rationale

I chose to use participant observations as a data collection method because it fitted in perfectly with my research paradigm of Interpretivism and my research

methodology of Action Research due to the fact that I was actively participating in the day to day running of the camp and had a need to gather data on the students' experiences and interactions. Generally speaking, observations as a data collection method yield holistic, rich data and layered descriptions of real life (Geertz, 1973). Participant observations gave me the opportunity to gather data on naturally occurring social interactions that could not be captured in any other way. It was a way of gathering verbal, non-verbal and physical occurrences, therefore enabling me to collect richer data overall. This is known as 'Naturalistic Observation' (Cohen *et al*, 2011, p. 111). Observation data from a participant observer was a valid way of collecting information on the student experience of the camp, as I was able to see how engaged students were, whether they were enjoying themselves and whether they were sustainable in their actions.

Design

I had to ensure that I was objective when recording observations to prevent inferences and biases from creeping in. In my research I took the role of an objective observer, recording data in a qualitative manner. Whenever I saw, heard or observed behaviors pertaining to the focus questions of my study I recorded a few notes as to what was said/done and the context in which it occurred.

Obviously I could not be completely objective, but I have described my inherent biases in the section titled 'Axiological position in this research'. Within my research I took the position of 'Participant observer'. A 'Participant observer' discloses the fact that they are taking observations, participates in the intervention and drives the agenda of conversations and actions. I was the teacher in charge of a camp of 13 students and 3 teachers (including myself), I had pre-existing relationships with the students and teachers, and I was the only teacher adequately knowledgeable in the studied context to be of use to the participants. I drove the agenda in order to ensure that students were able to experience the fullness of the experience, that they were able to meet the NCEA requirements and that they maintained cordial social interactions. All students and teachers were aware that I was using observation as a data collection method and accepted this as part of the informed consent process. Mine was a fairly unstructured observation method, I had some idea of the sorts of evidence I was looking for, but I was unable to make

a firm decision until I was already on camp and had seen the types of behavior present. This is because I was trying to gauge the student experience of the camp, which is not something that can be predetermined. Certain aspects of evidence for sustainability literacy can be predetermined (as was outlined in sections 2.5 & 2.6), and I had already thought out what could constitute evidence of this beforehand.

Critique

There are numerous associated pitfalls with using participant observation as a data collection method. Chief amongst these is the inability of the researcher to be completely free of bias, particularly (as in my case) when the researcher is involved in Action Research (Denscombe, 2008). There is also a tendency for researchers to only record what they deem to be evidence, so they end up missing some data that may prove valuable. Participant observation does tend to take up quite a lot of time, and can be very dependent on the mood or conditions affecting the observer personally (such as being tired) (Kawulich, 2005, p.7). As with any form of observation, there is a certain element of 'reactivity' where the observed act differently while they are getting used to the observer. In my case this was not such a problem as the students were already used to me, plus any notion of reactivity would have dissipated relatively quickly over the period of ten days (Watts, 2011). Observation data, particularly that generated by a participant observer in an unstructured fashion, is not easily quantifiable. This is somewhat of a double-edged sword, a wide range of observations and lack of structure around what is recorded is useful if that is what the research calls for. Personally, I wanted a wide range of observations, because it was complementary to my far more structured questionnaire.

3.7.3 Focus group interviews

Rationale

An interview can be defined as a "human interaction for knowledge production" (Kvale, 1996, p.14). However, interviews are not merely an exchange of information, but a rich socio-cultural experience (Walford, 2001, p. 90). I chose to utilize focus group interviews as a data collection method for a multitude of reasons, chief among these was because I wanted to elicit student voice/experience of the

camp. Focus group interviews allow for students to give their own thoughts and opinions which fits well with my Interpretivist paradigm and Action Research methodology (Morgan, 1996). Within Action Research the people's opinions are heard and valued, and as a result interviews generate more new ideas than other methods of data collection (Fern, 1982). Students' views are likely to be different and more detailed than adults' estimations of what the children may have thought, felt or experienced (Balen, Blyth, Calabretto, Fraser, Horrocks & Manby, 2006; Eder & Fingerson, 2002).

One of the strengths of interviews as a data collection method is that the data generated (despite being essentially a transcript) can be coded and transformed into statistics (Cohen *et al*, 2011, pg.407). Interviews can give statistically valid results comparable with quantitative research when analysed effectively (Morgan, 1996). They can also be used to give a 'voice' to groups who are often ignored (Matteson & Lincoln, 2009), in my case this group was the 13 students on my camp. In the vast majority of their learning at Secondary School students have little to no voice in the direction of their own education (Berman, 2004). Interviews are also useful when investigating sensitive topics that individuals will not disclose in depth via questionnaires or those recorded via participant observations (Cohen *et al*, 2011, pg.176). In my research it was difficult to tease out the student experience of camp through structured questionnaires or via looking at their work. I could rely on my observational notes somewhat but they are tinged with my interpretation of events. What I was really interested in was the students' experiences of the intervention. The principal strength of interviews is that the depth of the answers generated is far greater than that seen in surveys and observations (Morgan, 1996). Interviews are a far more natural situation than answering questions on a piece of paper or being observed, and as a result people are far more likely to tell the truth (Eder & Fingerson, 2002; Mauthner, 1997).

Interviews can either be conducted in 'focus groups' or one on one. My main goal with the focus group interviews was to elicit student experience of the camp. A focus group is better suited to this task due to the fact that the camp was a shared experience, having students in groups allows them to recollect the shared experience by prompting each other's memories (Heary & Hennessy, 2006). Focus groups can be defined as an exploratory discussion led by a facilitator who uses

questioning to reveal the participants' opinions, perceptions and experiences (Cohen *et al*, 2011, p. 436). Focus groups are known to elicit a more thorough understanding and may lead to disclosure of sensitive information due to the fact that people feel safer in groups (Heary & Hennessy, 2006).

Design

The purpose of my research was 'closed' because I was attempting to find comparable data, identify relationships and triangulate data. As such it required a different framework to a more 'open' purpose such as finding new hypotheses and new information (Vinten, 1988). Because of this, I required a more structured methodology, as I was cognizant of what I did not know and was searching for specific knowledge. The downside of utilizing a structured interview was the lack of new information generated, as I tended to redirect the conversation towards what I wanted to find out. On the other hand, a highly unstructured interview is unlikely to provide the answer to a specific research purpose. My role as an interviewer was semi-structured. Because I wanted the conversation to flow, I would introduce a question to the group and allow them to discuss it, however if someone's voice was not heard I would directly ask them, and if the question was not answered by the dialogue, I would redirect the conversation.

In order to provide data for comparison/triangulation I decided on 13 Questions which were directed at the different research questions of my study (see Appendix B). Early questions were essentially 'warm ups' before deeper, more open questions were asked. Of my 13 questions, all of them were open so as to stimulate a conversation and facilitate a natural setting for divulging information. This is because open questions lead to discussions, whereas closed questions lead to short statements or facts (Vinten, 1988). Within my research I chose to take a relatively passive role, I would pose questions and only get involved in order to elicit a response from a silent group member or to re-pose the question if it had not been answered. The focus groups were made up of 3-4 individuals and were in the 'tent groups' from the intervention. I chose groups of this size because smaller groups allow for more revealing responses and allowed me to have more control over the discussion (Morgan, 1996).

Focus groups were either male or female, to further reduce social barriers - students at 14 years of age tend to act differently around the opposite sex (Morgan, 1996).

Critique

Direct interaction with the research subject is the origin of all advantages and disadvantages of using interviews as a research technique (Borg, 1963). Given that the answers are based on the interpretation of the question there is always room for error, particularly where children are involved (Garbarino & Stott, 1992). For this reason, I designed all of the questions in 'student speak' so that they required little explaining and were easily understood. The situation of being in an interview is unnatural for children, and they may be scared and reluctant to provide an answer (Punch, 2002). On the other hand, they may perceive the researcher as having power, and will pander to what they think the researcher wants to hear (Garbarino & Stott, 1992). In this regard, I feel that the nature of my relationship with the participants was convivial and students were relaxed and able to talk freely. The ten-day camp was a great way of getting to know each other, and being together for that amount of time outside of school broke down a lot of social and institutional barriers. When conducting the interview, I had to be careful not to ask leading questions and jeopardise the validity of my results (Matteson & Lincoln, 2009). I got around this by spending time refining my questions with my supervisor and practicing the interview process beforehand to avoid asking leading questions. My personal pedagogy is to act as a facilitator which means that I am practiced in shifting a conversation without leading, suggesting or giving away an answer.

The chief drawback of using focus groups as a research method is that group dynamics can and do influence the opinion of the individual (Cohen *et al*, 2011, p. 436). A study by Lewis (1992) compared the data gained from focus groups and individual interviews and found that children tend to be influenced by the ideas of others and adopt them as their own. As a result, focus groups tend to give more homogenous responses than individual interviews. Fern (1982) found that individual interviews produced 30% more ideas than focus groups, and the ideas were of a better quality. Unfortunately, children often feel pressured to perform and provide the 'right' answer in interviews – a situation that is exacerbated in individual interviews over focus group interviews (Kellett & Ding, 2004). Focus

group interviews require researchers to have extended experience working with people of that age and demographic, as well as sound knowledge of child development theory (Garbarino & Stott, 1992). As I have mentioned previously I had a prior relationship with many of the participants beforehand and years of experience working with youth. I had spent a significant amount of time developing a trust-based relationship with the participants, which may have allowed them to divulge their own experiences of the intervention (Garbarino & Stott, 1992). Other constraints are the time it takes to plan for and conduct interviews, even to get participants to agree to take part (Gill, Stewart, Treasure & Chadwick, 2008).

3.7.4 Document analysis of participant assessments

The purpose of analysing participant assessments was to investigate whether participants could be engaged in learning outdoors whilst maintaining or improving upon their grade point average. By doing so, students would provide evidence whether issues based outdoor learning under the theme of Sustainability can be engaging and embed Sustainability principles without sacrificing the standard of achievement that schools are so concerned with. As part of the intervention, students completed two NCEA Level 1 Science achievement standards. These standards were chosen for their adaptability to the context of mining affecting water quality and their relevance to the learning experiences we undertook. The standards also allowed participants to explore sustainable ways of being and viewing the world around us. There were several constraints that achievement standards were contingent upon, they had to be able to fit into the timeframe of the intervention (10 days), they had to be relevant to the context and they could not clash with any of the Year 11 Science courses that students would be taking the following year.
The achievement standards chosen (see Appendix C) were:

1. Achievement Standard Biology 90951: Investigate the biological impact of an event on a New Zealand ecosystem.
2. Achievement Standard Biology 90925: Carry out a practical investigation in a biological context, with direction.

At the culmination of the intervention the achievement standards were marked by a third party (a trained Biology teacher) as per the NCEA requirements. Following this the marks were be checked by another trained Biology teacher in order to maintain consistency across grades. Participants who were eligible to improve their

grades were able to do so via conferencing. These conferenced pieces of student work were then checked again by the original marker to confirm the grades. Lastly, the grades were loaded onto the NCEA assessment database and participants received their grades. This seemingly exhaustive process is important for ensuring the validity of the grades so that I could confidently draw conclusions from them. To access the grades of students I met with the grader and went over the mark schedule, student work and final grades so that I could understand if my camp provided students with all of the knowledge required to meet the assessment criteria. I printed off the grades of students that were part of the research as well as their grades in a Level One NCEA Science achievement standard that they had completed in the month prior to the camp to be used for comparison. These results were placed in a locked briefcase which was either with me personally or locked securely in my home.

3.8 Data collection and analysis

Questionnaires

Students took between 10 and 20 minutes to complete the questionnaire. Responses to the pre-questionnaire were locked in my briefcase at home once completed. They remained there until the completion of the camp, when they were joined by the post-questionnaires. I entered the raw data into a Microsoft Excel spreadsheet, then coded the data into several categories: Sustainability values; Sustainability intentions; Mining knowledge; Water quality knowledge; Connection to place; Social connections; Engagement with learning. These codes were chosen because they would help to categorize the answers to my research questions and were informed by PRE, IBE, OL and EfS. I processed the data from questionnaires in three ways: change, median scores, and tallies. To calculate change for each individual I looked at each question (there were 19) and determined whether the student had made a shift towards increased sustainability literacy/knowledge or less sustainability literacy/knowledge and by how much. This was attributed a numerical value, for example +1 would mean a shift of one place (in a scale of 1-5 in semantic differentials) towards more sustainability literacy/knowledge. This data was then averaged for each student to give a numerical value of change in each category and across all students to give a class average of change. I also worked out

the median pre-scores of students for each question, then averaged these for an overall median for each category. I repeated this process to calculate the median post-scores. The final method that I processed the data was by tallying the responses to each question in the pre and post questionnaire to track how many people had chosen each answer and to track individual movements within questions. I then put processed data into graphs and identified trends within the data, which were compared with trends found in my observations and focus group interviews.

Participant Observations

My observations were recorded at the end of each day. It was too difficult to keep a running log when taking the role of participant observer, supervisor, organizer and teacher in charge. My notes consisted of conversations I had overheard, conversations that students had with me and actions that students had taken. My first step in processing the data was to code the observations. The codes I used were the same as above: Sustainability values; Sustainability intentions; Mining knowledge; Water quality knowledge; Connection to place; Social connections; Engagement with learning. After coding, I identified trends within the data, then triangulated my trends with those found in my analysis of data from my questionnaire and focus group interviews.

Focus group interviews

Focus group interviews were intentionally conducted directly following camp, because conducting interviews after a long period of time has passed makes it more difficult for students to recollect their experience (Ruspini, 2002, p. 97). The interviews were recorded on a Dictaphone, and then downloaded onto my personal computer into a password-protected folder. I transcribed the interviews word for word, then coded the data into several categories, as above: Sustainability values; Sustainability intentions; Mining knowledge; Water quality knowledge; Connection to place; Social connections; Engagement with learning. After coding, I identified trends within the data, then triangulated my trends with those found in my analysis of data from my questionnaire and observations.

3.9 Validity

Validity can be defined as the accuracy of information gathered and presented (Schwandt, 1997). The main purpose of maintaining a valid study is so that your

research can be trusted. To improve the validity of my research I have been transparent in my methodology, and I tried to maintain objectivity throughout my observations and teachings (Kitwood, 1977). I took the time to plan my research design, and I followed it to the best of my ability. During the planning phase I piloted aspects of the questionnaire on a small group of students (five) to increase student comprehension and therefore the validity of the answers received. As recommended by Moser and Kalton (1977), I double checked the answers to the questionnaire once data entry was complete to ensure that my recording of the data was accurate. I also double checked that my transcription of the focus group interview matched the recording to ensure accuracy. I revisited my data several times to see if my interpretations of the data actually made sense, as recommended by Patton (1980). My supervisor also viewed the data and we discussed whether the trends that I identified were justified or not (Creswell & Miller, 2000). To gain further validity I 'triangulated' my data, that is – I compared the data gained from the questionnaires with the data in my own observations and the data from the focus group interviews (Winter, 2000). This enhanced the credibility of the data. The notion of cultural validity was not such an issue in my research as the majority of students were from the same culture as me. I acknowledge that no one person has the same culture as any other person but there were no language barriers, students from other countries or students from vastly different upbringings than my own.

3.10 Reliability

Because my research was rooted in the Interpretivist paradigm and Action Research methodology, the notion of reliability applies somewhat differently than it would to positivist research. Because my data is more qualitative in nature, the term reliability is generally replaced with dependability. By its very nature, my research was and is unique and realistically impossible to repeat. Therefore, the dependability of the data relies more on the correlations found within the data than any attempts to repeat the study or compare it with others. This is known as internal reliability. Having three methods of data collection improved my ability to triangulate my data and increased the dependability of trends identified across all three methods. The dependability of my findings could be improved if similar studies found similar results – this is known as external reliability.

3.11 Ethical considerations

It was important that I acted ethically at all times and followed ethical procedures for accessing participants, obtaining informed consent, keeping information confidential and individuals anonymous. I also had to gain ethical approval from the University of Waikato Ethics Committee (see Appendix E). Because my participants were adolescents, I had to access them via 'gatekeepers' such as their parents and the school Principal. I had to be transparent in presenting the aims and methodology of the research, and honestly address any questions or concerns. Without consent, individual students could not be approached. To do so I first spoke to the Principal about my research and provided him with an informed consent form which would allow me to carry out my research. Once this consent had been gained, I was able to attempt to attain informed 'assent' from the participants. Informed assent is essentially an informed consent form tailor-made for the adolescents using language that they can understand (Broome, 1999). To ethically gain 'assent' the participants were given a form to read alone at school and were given the option to fill it in without pressure or deception from myself or their parents. The purpose of this was so that students could understand the costs and benefits of the situation, and be legally capable of consenting (Broome, 1999). To gain parental consent students were asked to take the form home and show it to their parents to read and fill in if they were interested in partaking in the research (see Appendix D). Students were given full assurance of confidentiality if they chose to partake in the research (Gibson, 1996). They were also made fully aware of their right to withdraw at any point, without repercussions (Gibson, 1996). I held an information night for the parents and made sure that I contacted each parent individually (after they consented) to give them an opportunity to ask me any questions. In the findings of the study, I have been very careful to ensure that the participants' names are not linked to the data presented, and that they are not able to be recognised based on the data (Boruch & Cecil, 1979). Anonymity has also been provided for the institution from which the students came, and all efforts have been made to make it unrecognisable. Lastly, I considered whether the research would have any repercussions such as reflecting negatively on a school or an individual, or offending someone in power. I am confident that my findings will have no negative repercussions.

3.12 Summary

In this chapter, I have outlined my research questions, Ontology, Epistemology and Axiology. My research paradigm of Interpretivism has been explained, as has my methodological approach of Action Research. I have outlined the data collection methods that I chose to use within the study, taking into account validity, reliability and ethical considerations. There is sufficient detail provided for researchers wanting to compare their studies to mine or for an attempt at a repeat of my study. Following my methodology has led me to collect a range of valid and reliable data, which I have presented in the following section 'Findings'.

4. Findings

4.1 Chapter overview

What follows is a synthesis of my collated data grouped into six main categories. The data is categorized this way to illustrate responses to the research questions. Each research question is multifaceted and requires breaking down in order for it to be answered comprehensively.

Section 4.2 and 4.3 directly relate to research question 1 (student experience on camp). Sections 4.4 and 4.5 directly relate to research question 2 (development of sustainability literacy). Sections 4.6 and 4.7 both seek to answer research question 3 (achievement & knowledge development). I have split self-reported knowledge and achievement because student development of knowledge and NCEA achievement can be independent of one another. I draw upon analyzed data and a specific case story in order to answer my research questions. Because of the small sample size (n=13) my findings are not statistically viable, so the descriptive statistics presented are indicative only.

In the sections below I refer to evidence from focus groups as *FG*, evidence from personal observations as *PO* and evidence from questionnaires as *Q*. Throughout the findings I refer to individual students in two letter codes, for example GJ. These letters represent the first and last names of the pseudonyms that they chose for the camp. In no way do they represent the actual names of the students. The list of student initials is below so not to confuse them with the codes used for evidence:
NW, H, BB, JD, SS, WV, RF, CL, TC, TT, BS, GJ, DJ.

4.2 Student experiences on camp

I examined student experiences on camp in order to gauge the enjoyment and engagement of students in the intervention and to establish the nature of the experience. It was important to me that the students enjoyed the intervention and were engaged in the learning – whilst maintaining achievement levels. At school, where achievement is the sole focus, it is possible for students to attain a high level of success in NCEA without being engaged in, or enjoying the process of learning so long as the learning is seen to be useful (Graham, Meyer, McKenzie, McClure

& Weir, 2010). This is a contributing factor to the self-perpetuating industrial model of education in New Zealand – teachers keep telling students that the information is useful and for some students that is all they need (Graham *et al*, 2010). I intentionally developed the programme so that students could enjoy the experience, be engaged and challenged by the learning opportunities and develop sustainability literacy. Success in NCEA is therefore a consequence or co-incidence within my intervention, not a goal.

In the sections below I have coded data concerning student experience into two categories: enjoyment (4.2.1) and engagement (4.2.2) which includes engagement with IBE, OL and skills learning (part of PRE). EfS is not included here as it acts as the 'umbrella' under which the other theories operate, therefore all data is relevant to EfS. The student experience findings are then summarized (4.2.3).

4.2.1 Enjoyment

The most common experiences the students mentioned that they enjoyed on camp were related to outdoor activities such as hiking or swimming (mentioned by 10/13 students, *FG*), with equal emphasis placed on memorable social interactions (mentioned by 10/13 students, *FG*), with smaller numbers mentioning learning experiences (4/13 students, *FG*). This is a positive sign that students were making connections with the natural environment, which is the first step towards developing an ethic of care (Hill, 2013). It also affirms that learning has a highly social element (which I encouraged and planned for) and that this is not detrimental to student learning (see findings below in Section 4.7). The fact that some students mentioned learning experiences as one of their three most enjoyable experiences on camp was affirming that all aspects of the camp were (at least to some students) enjoyable.

The outdoor activities that students enjoyed the most were: swimming at the swimming hole (mentioned by 8/13 students, *FG*), hiking in the forest (5/13 students, *FG*) and staying in the hut that we completed an overnight camp to (3/13 students). Comments included "I liked going for the real long hike and swimming heaps" (GJ, *FG*) and by RF "The hikes were pretty fun" (*FG*). These findings meant that students were connecting strongly with the waterway that we were focused on evaluating, which may have led them to care more about the wellbeing of the

freshwater environment (Hill, 2013). An increased care for waterways was seen in the pre/post comments section of the questionnaire, where most individuals (12/13) changed their response (to the question: Do you care about the Karangahake Gorge area? Why/Why not?) to one with more emotive language and justified their 'care' by drawing on their own experience there. Most students (12/13) said that they cared about the area before the intervention, but it was the nature of their language that changed from pre-camp to post-camp. After the camp, CL mentioned "I do care about the Karangahake Gorge, it is a great environment for living things and it deserves to be looked after" and BB said "Yes I care now that I have experienced it and seen how big of an effect mining can have."

The most frequently mentioned social interactions were anecdotes around camp life such as tripping over (mentioned by 6/13 students, *FG*) and the creation of friendships (4/13 students). The creation of friendships was something that I personally observed. One student (RF) mentioned to me that "TC is actually a really nice person once you get to know him/her" (*PO*), and students had similar comments within the focus groups, for example, "I enjoyed being with our form class and learning more about them" (TT), "We made some unbreakable bonds" (BS) and "We fell asleep holding each other's hands until we lost all the blood-flow" (SS) (All from *FG*). Relationships developed amicably on camp and I observed that students treated each other with more respect, humour and patience than I am used to observing in a school environment (*PO*). I managed to develop far better relationships with the students as a result of the camp, which may in no small way have contributed to the positive student experience on camp (Kuh, 1995).

Within learning related experiences, students mentioned that the water testing was enjoyable (2/13). Examples of this are in the comments of SS: "collecting the bugs was really fun" (*FG*) and DJ: "I found the first day of water testing fun" (*FG*). Two students (TT&TC, *FG*) commented that learning about mining was one of the most enjoyable parts of the experience: TT said "I enjoyed learning more about the negative and positive effects of mining" and TC commented "I enjoyed finding out about the impact of the mining". Also mentioned was the fact that students had choice and a voice in their learning (2/13 students, *FG*), as NW commented: "I liked getting to choose what we did and getting credits for what we did". Additionally, DJ commented that he/she enjoyed the teaching method "I actually found the

writing fun because we got heaps of help with it" (*FG*). These comments are very valuable in that they confirm that the use of IBE (in the context of whether mining was influencing water quality) was an enjoyable way for students to learn. These comments also give positive feedback to the pedagogy implemented: students were included in planning the course and enjoyed having a voice.

When asked about what they would do to improve the camp, there were a range of responses. Many (5/13) students commented that they wanted to stay longer (CL: "Stay longer I think, at the end we were all quite close and then we had to go."(*FG*), BS: "To stay longer."(*FG*), SS: "I feel sad that I missed out on the first half" (*FG*), although one student (TC, *FG*) thought the camp was too long and one wanted less work (SS, *FG*). Three students (DJ, SS, BJ; *FG*) commented that they enjoyed the experience and that they would gladly do it again, for example DJ said, "It was fun, I just liked the camp." (*FG*). Two students even commented that they enjoyed the work (SS: "It was just quite stressful (the work), especially for me because I'm a perfectionist. But I really enjoyed it anyway. I would do it again." (*FG)* and BS: "It was hard to do that amount of work in a short amount of time but I think it was good" (*FG*)).

The reasons given for wanting to stay longer were predominantly socially based, students had developed close bonds with each other, as can be evidenced in the comments of RF: "We should have done the camp at the start of the year. Then we could have made the bonds closer. I had no friends for most the year." (*FG*) and BS: "We would have had such better class time if we had this at the start of the year" (*FG*).

These comments further indicate the importance of strong positive interpersonal relationships to learning (and happiness) and a more holistic approach to learning that includes social aspects (Mirrahimi, Tawil, Abdullah, Surat, & Usman, 2011). Students' comments affirmed their appreciation of the flexible nature of the camp schedule that allowed time for breaks to socialise and play. As the students were using the environment that we were studying (Waitawheta stream) to socialise and play in, this likely strengthened their bond with and understanding of the area (Francis, Paige, & Lloyd, 2013). Learning *in situ* is a far more enjoyable way for students to learn, as opposed to being put into a room for five hour-long periods

and then being expected to work the whole time with little socialising, which is hard for many students (*PO*). I personally noted several students commenting that "this is a way better way to learn than school" (SS, BS, CL) (*PO*).

I noticed very little complaining coming from the students, they were enthusiastic, happy and content whilst on camp (*PO*). I observed students chatting and playing with those outside of their usual peer group. In fact, the only time that I noticed students withdrawing or lamenting that they might have been missing out on things at home, was when we sporadically had an hour of cell phone reception. Aside from this occurrence, there was a complete lack of cell phones or other devices (having no reception or Wi-Fi was very fortunate). There was no misbehaviour or conflicts – they were a very harmonious group. They managed their time well when given a flexible schedule to complete their work, making sure that they had a break when they were tired, yet still maintaining the drive to complete the work.

Enjoyment summary

Findings about enjoyment have indicated several interesting trends. Most students enjoyed the outdoors activities, a positive sign that students were making connections with the natural environment, the first step towards developing an ethic of care. Students showed an increased care for waterways through use of more emotive language and drew on their experiences to justify why they cared about the environment. Social interactions were mentioned as one of the most enjoyable parts of the camp, which serves to emphasise that learning is a social phenomenon. This highlighted the importance of positive relationships and positive daily interactions in the enjoyment of an experience. Students indicated that the school environment is inherently stressful and that the environment encountered on camp (whilst actually requiring more work than they would do at school) was more relaxing, enjoyable and stress free. Several students commented that the use of IBE (in the context of whether mining was influencing water quality) was an enjoyable way to learn. Students were positive about being included in planning the course and enjoyed having a voice.

4.2.2 Engagement

Engagement is a measurement of students' willing and joyful participation in learning activities. Their engagement was important to me as it provided evidence for the utility of my pedagogy and teaching unit. As the teacher, I observed engagement in students asking questions, in their inquisitiveness, in their ability to concentrate on the task with a distinct lack of complaining. There were several discrete formal learning activities (such as completing water surveys and river crossing technique practice), as well as informal learning that took place at any time (such as students asking questions about which plants they could eat). Focus group questions were customised to tease out student experiences of engagement with aspects of the intervention design, such as: IBE (Q6: Do you think that learning through focussing on the issue of mining made the learning more or less interesting?), OL (Q7: Did you find learning outdoors more or less fun than if we were learning about stream health in a classroom?) and PRE pedagogy (Q4: Do you think that spending time learning to be safe in the environment allowed you to feel more comfortable with getting in the water to complete stream surveys?).
Responses to these questions provided a good representation as to whether or not the students were engaged with learning and these are discussed below.

Engagement with Issues Based Education

Each focus group gave a resounding "yes" when asked if focussing on the mining issue made the learning more interesting. Students in the groups after responding 'yes' immediately started discussing the issue of mining in Karangahake Gorge, which I let go on for some time before I brought them back to the structured questions. Their reactions to this first question and subsequent discussion of the issue at hand confirmed that students were engaged in and passionate about the conservation of Karangahake Gorge.

Student reasons for why IBE was more engaging were: that it was a real life issue (H: "its an actual issue and we can see something that's actually happening/gonna happen and how it will affect it", *FG*); that it gave people who were against mining extra motivation because they could contribute to stopping it if the water survey findings were conclusive (NW: "It gave us more motivation especially for the

people that didn't like mining in the first place, it motivated them to find out that it is harming the environment to prove what they thought, I think it definitely helped, it would have been very boring if we were just like - Is this stream healthy", *FG*).

Others mentioned that focussing on an issue made the learning more interesting because it allowed for them to learn about the whole picture, not just water testing in isolation (GJ: "More interesting because it gave it something to link to and see if it actually affected it", *FG*, DJ: "Yeah it made it more interesting 'cos we've never covered mining specifically in a subject, so doing that, linking it with something else, you kind of learn two at once", *FG*). Students also commented that engaging in the issue of mining was interesting because it furthered their understanding and challenged their perspectives (SS: "now we feel like we actually understand how it can affect the river and why mining might not be the best thing", *FG* and TT: Probably more interesting, to start off with I thought mining was cool but after the week I think it's bad now because of how it affects the environment and because they don't really care. It's not worth it" *FG)*.

Student responses indicated that IBE was effective for them as a method of increasing engagement and relevance for students when structured and implemented as it was on this camp. When we met with different guest speakers, students were engaged and asked meaningful, insightful questions to further their own understanding. Their high level of engagement in this topic may have led to their increased knowledge on mining and its effect on freshwater ecosystems (see Section 4.6). Engagement in IBE may have also contributed to the development of students' personal ethic of care for this particular environment, a vital part of sustainability literacy and a step towards action competence (Mogensen & Schnack, 2010).

Engagement with Outdoor Learning

Each group gave an emphatic "yes" when asked if learning outdoors was more fun than in a classroom setting. Their reasons for enjoying Outdoor Learning over classroom learning revealed in the focus group interviews were the following: The hands on nature of learning (H: "Yeah, it was more hands on and we actually got to do stuff instead of just sitting, WV: "We got a better understanding of the actual

topic by looking at it, just from being outside", CL: "It's good doing it practical, hands on doing stuff"); Because the learning was easier to understand because they were situated within the context (H: "Yeah I don't think I would have understood it as much if we learnt it in a classroom and you wouldn't be able to physically do the testing in class"): Because of the immediate relevance and the fact that students were following the study all the way through and gathering data themselves (NW: "at school you'd just get told and given data, it was more fun definitely than if we were in a class", DJ: "Because you're so hands on and you're actually physically doing it and seeing the results, it's not just like - here's the data, turn it into a graph, write about it").

Students also commented on how much they preferred working outdoors as opposed to indoors (CL: "It was really nice working in that environment"), because it was less stressful (SS: "It's much more comfortable and less stressful") and because people worked together and treated each other with respect (RF: "I feel like away from school everyone is so different"). Comments revealed that there were less distractions on camp (TT: "I reckon learning outdoors was better 'cos there's not really good (cell-phone) service so it makes it a better environment to learn in"). Finally, several students (TC, TT, BS) commented on how classroom learning has become boring and that they are unhappy with how much schooling takes place inside (TC: "Definitely outside, we're always in a classroom. It gets boring after a time and being able to be in the area where it's actually happening and explore there is better").

These responses made it clear that Outdoor Learning was interesting and engaging for the students because it was hands on, it engaged them in a real life issue, they created the data themselves and thoroughly investigated the problem. It was interesting that students commented again that the environment itself was nicer to work in, less stressful and that the improved relationships between students contributed to a more enjoyable and engaging work environment.

Engagement with skills learning

In PRE and EfS literature there is evidence that allowing students time to become comfortable in their environment and to enjoy it is the first step towards students

developing an ethic of care for the area (Brookes, 1989). It was for this reason that I allowed for an acclimatisation period where students were provided opportunities to explore the area and to gain skills and experience that would make getting around in the environment a bit easier and safer. As well as giving students subtle tips on gear, foot placement, food management and other daily camping/hiking hints, I gave a few group lessons on water safety – specifically in stream/river crossing technique. My thinking in doing so, was that it would help students to feel more confident in the river, so that their energy and thinking could be directed more towards the sustainability issue than staying alive (Wattchow, 2008).

Students responded positively to having the time to 'find their feet', I personally observed that students would ask for help once, then take the knowledge and use it to help others – in this way a simple tip such as foot placement made its way around the group. I saw students adopting walking partners who they would rely on to help them out when tricky sections were encountered. During the periods of instruction students were attentive and I made sure that I only gave the instruction when students asked for it and needed it. I let them make some mistakes first so that they could see the need for instruction and hence be more engaged in its delivery. Students responded positively to this instruction and there was a noted improvement in both teamwork and communication on track conditions (*PO*). This was evidenced in student responses within the focus group interviews such as: WV: "The river crossing lesson helped because I had no idea how to cross a river without slipping over" and H: "Yeah I would have tried to stand on the sticky outie rocks and fallen over, that's probably why I normally do slip". Students also commented on the effectiveness of the buddy system (BS: "Yeah 'cos I fell down a couple of times alone," and BB: "I felt a lot safer with my buddy"). Anecdotally, I noted that students appeared confident and unperturbed about working in the river after instruction – whereas our first few encounters of river crossings were met with trepidation by many members of the group.

Therefore, with the group I had, I can suggest that this acclimatisation period fulfilled its intended purpose and allowed students to feel more comfortable in the environment and therefore better able to engage with IBE. I also note that my pedagogical approach appeared to fit in well with the nature of the camp, in that learning was done by exploration and I was there if students needed me. This

approach of letting people make mistakes is not common within a schooling environment, but very common outside of it and a more effective way of learning (Mason, Yerushalmi, Cohen, & Singh, 2016). I wanted to give students the opportunity to learn from mistakes in a supported environment, like a toddler walking with a parent alongside – just in case. My pedagogy in this regard drew heavily from the work of Vygotsky (1978) and his theory of the Zone of Proximal Development (ZPD). The theory essentially states that the range of student abilities can be extended by having a more knowledgeable companion (in this case, me) who provides responsive scaffolding. This meant that I had to keep providing students with challenges and just the right level of support so that they could confidently attempt the problem. Students took a while to get used to this style of learning, at first they were a little needy, but as time went on they were more determined to figure things out for themselves (*PO*). They began to see problems as challenges.

Engagement summary

With the evidence available from my Personal Observations and the focus group interviews, I can confirm that students were engaged in all the different aspects of the camp. This includes IBE, OL and skills based learning. During the camp, the pedagogy and framework of these three areas were amalgamated with those of EfS. Essentially, EfS was taught through the combination of these three approaches. The acclimatisation period was well received by students, as it allowed them to feel more comfortable in the environment and therefore better able to engage with IBE. Student engagement led to increased knowledge on mining and its effect on freshwater ecosystems and the development of their personal ethic of care. Comments showed that Outdoor Learning was more interesting and engaging (than classwork) due to its hands on nature in the context of a real life issue; that the environment itself was more relaxing to work in and that the improved relationships between students contributed to a more enjoyable and engaging work environment.

4.2.3 Summary of student experience

Analysis of the student experience included enjoyment and engagement, from my findings I can conclude that the vast majority of students did enjoy the experience (the summary of which is in 4.2.2) and that they were engaged in learning

(summarised in 4.2.7). There were no negative comments attributed to either of these factors (no students complained, said that they were not engaged or indicated they did not enjoy any part of the camp).

4.3 Development of connection to place

Developing a connection to the place in which the camp was situated is part of the 'student experience' because it is a personal viewpoint/opinion/feeling towards the environment, cultivated from spending time within the environment and learning about it (Dolan, 2015). It was important for me to measure whether students developed a connection to place for several reasons. I designed the course with PRE and EfS principles in mind, I wanted students to develop a connection to place to see if they were able to care about the area (Lugg, 2007). Developing a connection to place is important in developing action competence within a local issue (Martindale, 2018). Caring about the area may also pique students' interest in learning more about it, engaging in learning opportunities and enjoying the learning process (Brown, 2012). I measured the extent of students' connection to place in three ways: Pre/post camp questionnaire comments, focus group interviews and personal observations.

Many of the students (10/13) had never been to the Karangahake Gorge area before, yet they still said that they cared about the area initially. Their reasons for caring about this place (that they had never been to) ranged from "Because it is a beautiful natural area" (JD & GJ) and "because it is a conservation area" (TT, BS) (*Q*). Following the camp, students still stated that they cared about the area, but their reasons were quite different. Afterwards they spoke of their experience, of the people living there and the connection that they had to the area after being there and learning about it (H: "I now know more about the Karangahake area and care more about it after learning and staying in the area. If I lived here, I would probably care even more", H: "because now I have been here I don't really want it to be impacted by mining" (*Q*)). In fact, a number of the students (5/13) brought up the fact that they were empathetic towards the local residents who were against mining. One student even spoke about how he/she values the area as "an escape from the city" (GJ)(*Q*).

TT initially said that he cared about the area "because it is conservation land". In

the focus group interview, TT revealed that he had never been there before which lead to a different and more thoughtful post-camp questionnaire comment, in which he articulated that "I care about the Karangahake Gorge area because it is a lovely place everyone should enjoy for centuries to come". What's important here is that there is an emotional connection to the area evident in the post-camp comment and that there is evidence of thought about the area's sustainability long term.

Students were asked whether they thought that spending time within the Karangahake Gorge had made them appreciate it more. There was a strong response with all students saying that having spent time in the area made them appreciate it more. However, there was a wide range of reasons for caring about the environment. Some related to connecting to the place/ appreciating the natural beauty of the area (DJ: "I'd never been there before and it's actually a really cool place", TC: "because it's so cool – you only really hear about the main tourist walks and you don't really go through the back ones" (*FG*)). Some students' reasons were related to knowing more about the mining and how it affects nature (H: "I got a better understanding of what was happening and how things can affect nature", TT: "I didn't know there was a new mining operation going on in the DOC conservation land" (*FG*)). Others stated that they appreciated the area more after the intervention because they could relate to the organisms living there (NW: "I don't love bugs and insects but I think it's good to protect them and keep them alive" (*FG*)). This goes to show that connection to place is a very individual concept – not all people will connect to a place for the same reason.

4.3.1 Summary of connection to place

In summary, I saw evidence of development of connection to place within the students. They often commented on areas that they particularly liked (such as the waterhole) and many students talked about coming back to the area and camping over summer (*PO*). For the vast majority of students, the camp exposed them to an area they had not seen before and some (such as TC) had never been camping before. Reasons for connecting to the place were based on experiences in the area and the beauty of the natural environment. Students used far more emotive language in describing whether or not they cared about the area in the post questionnaire than they did in the pre-questionnaire. This evidence supported the findings from section

4.2 in that students developed a strong sense of place, the precursor to an ethic of care and action competence.

4.4 Development of sustainability literacy attitudes/values

Sustainability literacy attitudes/values was measured in a number of ways. Firstly, the pre and post camp questionnaire had several questions aimed at probing the effect of the intervention on sustainability literacy attitudes/values. Secondly, there were several questions within the focus group items aimed at gauging the students' sustainability literacy attitudes/values. Thirdly, I am able to make a judgement on the progression of individual sustainability literacy attitudes/values from my observation notes.

Pre vs post Median scores (Sustainability Literacy)			
Question	Median pre	Median post	Changes
A: Reusable products vs Single use	4	5	1
B: Thinking vs not thinking about sustainability	3	4	1
C: Considering vs not considering values of others	4	5	1
D: Putting thought into actions vs not	4	4	0
J: Attitude towards mining	3	4	1
L: Considering others opinions vs not	1	1	0
M: Ability to tell the difference between symptom and cause	2	2	0
N: Definition of sustainability	4	4	0
O: Are the needs of humans above the needs of other living things	5	5	0
Q: Treaty of Waitangi understandings	3	2	1
R: Economy or Environment as a priority	4	4	0
S: Putting planets' needs before personal preference	2	2	0

Figure 4.1: Development of sustainability literacy attitudes/values evident in median scores (Green indicates a shift towards the more sustainable answer).

To investigate any changes in sustainability literacy attitudes/values within the questionnaire I used several methods of data analysis. The questionnaire used a Semantic differentials scale to quantify where students stood on a particular statement. The score showed whether they were moving towards the more sustainable answer, away from the more sustainable answer, or not moving at all in their thinking. There are only 5 points on the Semantic differentials scale I used, so when a movement is described I indicate by how many points. As can be seen in *Figure 4.1,* the 13 students had together made a change towards sustainable positions (by one point) in 5 out of 12 sustainability literacy areas, with no negative movement at all. (Incidentally, different questions have the more sustainable answer at different ends of the scale – so a positive shift does not necessarily mean towards the larger number). Therefore, as a group, on average, the students had moved towards the more sustainable positions. These shifts related to improved sustainability literacy in regards to an improved attitude towards re-useable

products (A), more thought of how to make society more sustainable (B), increased consideration of alternate cultural viewpoints (C), a more negative attitude towards mining (J) and a better understanding of indigenous rights (Q). The other seven areas of sustainability literacy (which were: putting thought into daily decisions – is this sustainable? (D), thinking that everyone's opinion matters (L), understanding the difference between a symptom and the cause of a sustainability issue (M), having a holistic view of sustainability (N), thinking that all living things are equal (O), thinking that sustainability should take precedence over profits (R) and making an ethically sustainable decision on meat consumption (S)) showed no movement in the median comparison. There were however some large shifts (movements of more than one position) from individuals in the seven areas that had no median shift as a cohort. For example, a negative shift in sustainability literacy attitudes/values was seen from TT in question J, where he/she was the only student who had a more positive attitude towards mining following the intervention (from 5 to 3). In question L, SS moved from a 'sustainable' 1 (thinking that everyone's opinion matters) to an undecided 3. A positive shift in understanding happened with TC in question M, as he/she went from 4 (not knowing the difference between a symptom and a cause) to a confident 1 (definitely knowing the difference). In question N, DJ moved from 5 (holistic definition of sustainability) to an undecided 3. Both H and RF had a negative shift of two points in question O, meaning that they thought all living things were less equal after the intervention than before. In question S, DJ moved from a 5 (not making a sacrifice for the wellbeing of the planet) to an undecided 3. Aside from question J, all of these individual movements did not largely affect the median score which remained at 0. Essentially these individual movements can be seen as a variance in the data which was cancelled out by the opposite movement of others (shown in the lack of movement in the median score).

Students were not asked to give reasons for their selections of answers in the questionnaire, but I can pose theories on why students may have increased their sustainability literacy attitudes/values in some areas and not others. I can suggest that the movement towards an improved attitude towards re-useable products may be due to the pack in, pack out style of camping that students were engaged in (Miller, Hill, Shellman, Ramsing, & Lawhon, 2014). Students soon realised how much rubbish they were creating and commented that it was "crazy how much rubbish we made over 8 days" (BS, *PO*). The positive movement in thought of how

to make society more sustainable and the stronger negative attitude towards mining may have come through engaging with a sustainability issue (Rose & Cachelin, 2014). Increased consideration of alternate cultural viewpoints and a better understanding of indigenous rights may have come about through engaging with members of the community (Paul, 2006) and the fact that we had a diverse group of cultural standpoints on camp, with one Māori student who was very knowledgeable about her own culture and history.

Tally of Individual answers					
Question A	1	2	3	4	5
Pre score	0	2	1	6	4
Post score	0	1	1	3	8
Question B	1	2	3	4	5
Pre score	0	2	5	4	2
Post score	0	2	1	8	2
Question C	1	2	3	4	5
Pre score	0	0	1	8	4
Post score	0	0	1	5	7
Question D	1	2	3	4	5
Pre score	0	0	2	6	5
Post score	0	0	2	6	5
Question J	1	2	3	4	5
Pre score	0	0	8	4	1
Post score	0	0	6	7	0
Question L	1	2	3	4	5
Pre score	9	3	1	0	0
Post score	9	3	1	0	0
Question M	1	2	3	4	5
Pre score	3	7	2	1	0
Post score	3	10	0	0	0
Question N	1	2	3	4	5
Pre score	0	3	2	4	3
Post score	2	2	2	5	2
Question O	1	2	3	4	5
Pre score	0	0	1	5	7
Post score	0	1	3	1	8
Question Q	1	2	3	4	5
Pre score	5	1	4	1	2
Post score	4	3	3	0	3
Question R	1	2	3	4	5
Pre score	0	1	2	7	3
Post score	0	0	3	5	5
Question S	1	2	3	4	5
Pre score	4	3	3	2	1
Post score	4	3	2	4	0

	Most sustainable option		Least sustainable option

Figure 4.2: Table showing the tallied findings of students to the questions pertaining to sustainability literacy attitudes/values.

The tallies of pre and post scores (see *Figure 4.2*) show more positive trends (increasing sustainability literacy) and some explanations for the lack of movement in median scores. In the median score detailed above, there were 7 questions that showed no movement towards the sustainable statement. These were questions D, L, M, N, O, R, S (detailed above). Several of these questions showed no improvement due to the fact that students had no or very little room to improve their response. These are questions D, L, M, O and R. In these questions the vast majority (11, 12, 10, 12, 10 respectively) of 13 students were already in the green or sustainable side of the spectrum in the pre-questionnaire. The other two questions are more revealing, as in questions N and S students had plenty of room to improve the sustainability of their answer, but did not. What was it about these two questions? Question N's more sustainable statement is "I think that sustainability is about balancing the needs of our environment with the needs of our society, cultures and economy". Question S's more sustainable statement is "I would eat less meat if it reduced worldwide pollution and helped to stop climate change". These were the two questions that students received little to no information on, a flaw in the design of the camp.

In terms of improvement of sustainability literacy atitudes/values, there are five areas of improvement revealed in the tallies. Four of these improvements are the same as when looking at the median scores (A: a shift towards re-usable products, B: more thought on how to make society more sustainable, C: increased consideration of alternate cultural viewpoints, J: Negative attitude towards mining), one is different. This is: M: recognising the difference between a symptom and a cause (from 10-pre to 13-post on the sustainable side). This trend is an addition to the five changes in sustainability literacy attitudes/values seen in the median scores. I would theorise that the reason for students increasingly recognising the difference between a symptom and a cause is due to the fact that students had first hand experience gathering data which showed the difference between a symptom and a cause (they were looking at how different land uses affect water quality and freshwater ecology).

Another way of interpreting the data is to look at each individual student and deduce whether they made an overall increase or decrease in sustainability literacy attitudes/values. This is done per question by attributing a numerical negative score

to movements away from the sustainable option and a positive numerical score to movements towards the sustainable option, then averaging the score. The findings of this are shown below in *Figure 4.3*.

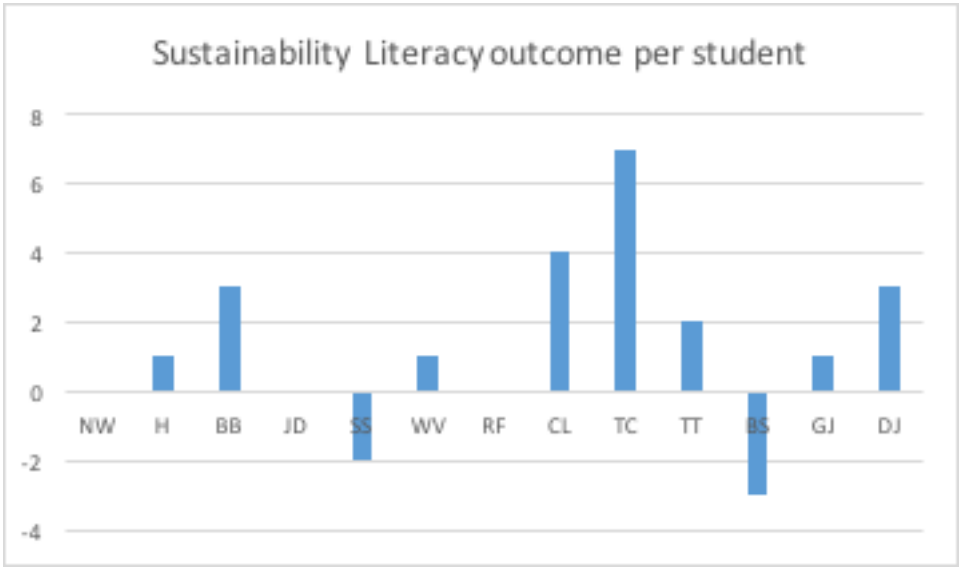

Figure 4.3: Showing the sustainability literacy outcome per student averaged over the 12 sustainability attitudes/values questions in the questionnaire. The higher the positive score, the more movement (on average) the student made towards the sustainable option. The lower the score, the more movement (on average) the student made away from the sustainable option.

In this form of measurement, the majority of students increased their overall sustainability literacy attitudes/values (8 out of 13 students). Only two students (SS and BS) ended up with decreased sustainability literacy and three (NW, JD, RF) had no overall statistical change in their sustainability literacy. Furthermore, four out of eight of those whose sustainability literacy improved had an increase of 3 or more points in contrast to only one decrease in sustainability literacy of 3 points. One student in particular experienced a large increase in sustainability literacy: TC with an increase of seven points – three more than his/her nearest contemporaries. To explore this further, a short case story is provided about TC.

Case story: TC

TC is a student who had very little exposure to the outdoors prior to the camp, in fact TC was apprehensive about coming on camp and very nearly pulled out. TC is intelligent and has been streamed in one of the top classes at school. TC is a remarkably unique student in both behaviour and general outlook on the world. TC is quite stubborn and strong willed with polarising views that are often not in line

with everybody else's thinking. TC is a student who had fairly poor sustainability literacy attitudes/values prior to the intervention and therefore likely had more room to change than other students, which may have accounted for the large increase in sustainability literacy. Many of TCs' ingrained unsustainable opinions dissolved in the face of real life experience (*PO*). TC learnt a lot of interpersonal skills and grew to be more tolerant of others on camp. This is another benefit of learning in a camp situation where everyone lives communally and cooperation is a necessity of daily life. This situation breeds tolerance and accountability (Smith, Steel & Gidlow, 2010).

The focus group interviews had several questions designed to tease out students' sustainability literacy attitudes/values. Because the focus group interview was not also conducted at the start of the camp there is no way to judge the change in student sustainability literacy attitudes/values in this regard. However, we can compare the comments and insights in the focus group interviews with the trends shown in the Questionnaire to triangulate student sustainability literacy after the camp.

Questions 9 and 10 of the focus group interviews were related to whether learning the opinions/points of view of others had a bearing on the students' point of view on the issue of mining in Karangahake Gorge. The visit to the mine and guest speakers were designed to expose students to different opinions (a key part of EfS). I found that during each occasion students were attentive, respectful and asked both easy and controversial questions. From the interview, students commented that the guest speakers did have an effect on their own thinking around mining, for example, GJ commented: "It gave me more information of their perspective and I probably value mining more because I know why it's necessary". Students were also keenly aware of the bias shown by the mining company's PR department: BS: "They tried to make us think it was good, eh", BB: "It was scary how they had the cyanide pools that "should" withstand an earthquake but I thought, what do you mean, should?" These anecdotes serve as evidence that students were developing their sustainability literacy attitudes/values in being able to see issues from the perspectives of others and understanding the part that the mining company plays in the big picture of the issue. This increased ability to see things from the perspective of others was also evident in the pre/post questionnaire comments. Students were asked under which circumstances they would be comfortable with mining taking place in Karangahake

Gorge. Their responses changed before and after the intervention: some went from being completely against mining under any circumstances (NW: "Under no circumstances") to a more moderate view, considering the benefits/necessity of mining and the increased environmental management (DJ: "Only if they did it in a sustainable way that kept Karangahake looking exactly the same way and kept the tracks and walks open", NW: "If it was safe, unharmful and contained"). Other students moved in the other direction, TC had a big change of heart, going from "Only if it was on a small scale, unlike Martha Mine" to "None, it's not ok at all." BS was similar, going from a moderate view "Only if it would not harm nature" to vehemently against "No, it will destroy the ecosystem". The same happened with CL. The important aspect here is that students changed their minds, which means that there was a thought process and a consideration of all they had encountered on the intervention. SS was the only student who initially said "I would not be comfortable with any mining" and stuck with it: "Under no circumstances". SS was also the only student who had spent time in Karangahake Gorge with her family prior to the camp, meaning that he/she had likely already developed a sense of place and an ethic of care for the Karangahake area.

4.4.1 Summary of development of sustainability literacy attittudes/values

Although the median scores only showed that students improved their sustainability literacy attitudes/values in five of 12 areas, on closer inspection, students actually improved in six areas in tallies. Furthermore, of the seven areas that the median scores showed students not improving, in four areas they could not improve because students had already chosen the most sustainable option. Students indicated less sustainability literacy after the camp in two areas: Understanding the meaning of 'sustainability' and making their mind up on the sustainability/ethical issue of whether or not to eat meat. This was likely a flaw of the camp design in that students were given very little information about these ideas.

When looking at individual student change in sustainability literacy attitudes/values, the majority of students increased their overall sustainability literacy attitudes/values (8 out of 13 students). Only two (SS and BS) ended up with decreased sustainability literacy attitudes/values (due to their choice in the sustainability definition and the ethical decision) and three (NW, JD, RF, GJ) had no overall statistical change in their sustainability literacy attitudes/values. TC had

the largest increase in sustainability literacy attitudes/values, most likely due to his/her poor sustainability literacy at the start of the camp. One benefit of learning in a camp situation where everyone lives communally (and actions have immediate consequences) was the requirement of tolerance and accountability on behalf of the students. This living arrangement may have served to increase student sustainability literacy attitudes/values simply by getting students to consider the needs of the group over their own, something that people who aren't living in a communal environment are less apt to do (Brookes, 1989). Students increased their ability to see things from the perspective of others partially from living in this environment and partially from engaging with the issue and meeting/interviewing all of the stakeholders involved. Students showed evidence of considering the opinion of others in their statements about whether or not mining should go ahead, which is an important factor in sustainability literacy (Lefebvre, 2000).

Students' attitudes towards mining changed towards being more negative for three students, and more positive for an outlier student (TT), who likely was led to this conclusion from the results gathered in his stream study. Because seeing mining in a more negative light was considered a more sustainable view in this scenario, TT's overall knowledge increase was quite low (2 points). Hence, there may be a link between the outcome of the stream study and student attitude towards mining.

4.5 Development of action competence

Action competence is an aspect of sustainability literacy. I separated it from the main findings of sustainability literacy (attitudes/values) because it is such a significant part of sustainability literacy and quite different to many of the other aspects of sustainability literacy. As such, if I commented on action competence as a part of sustainability literacy it would be much harder to distinguish whether students had become more action competent or not. Within this piece of research, action competence is seen as sustainability behavioral intentions. There was not time within the camp for students to follow through with taking action for/against the issue that they were studying.

As with sustainability literacy, I measured action competence through three ways: pre and post questionnaires, focus group interviews and personal observations.

Within the questionnaires, there were three statements that focused specifically on the development of action competence, the action competent statements being: (E) I believe that I can make a difference in the world by taking action on sustainability issues; (F) I believe that getting involved in decision-making (e.g. voting, protesting for what you believe in) is everyone's responsibility; (P) I think that if we make smarter decisions as a species we can make the world a better place to live in.

Pre vs Post median scores, Action Competence			
Question	Pre	Post	Change
E: Belief in making a difference by taking action	2	2	0
F: Belief in participating in active democracy	1	1	0
P: Belief in ability to make improve the world	5	5	0

Figure 4.4: Table showing median pre and median post score in questions pertaining to action competence. Any shift is also shown.

As can be seen in *Figure 4.4*, when comparing the median pre-score with the median post-score in questionnaires there was no movement towards or away from action competence. This was mostly due to the fact that seven students did not change their original score at all therefore their scores did not factor into the median scores regardless of how sustainable their answer may have been. Within the six students who changed their original scores there were some significant movements. RF went from thinking that decision making is mostly the council and governments' responsibility (4) to strongly thinking that decision making is the responsibility of all of us and that we need to get involved (1). This is a big step towards action competence for RF.

The tally of student responses to the action competence questions gave a more detailed picture as to what was happening *(see Figure 4.5)*.

Tally of Individual answers					
Question E	1	2	3	4	5
Pre score	2	7	4	0	0
Post score	2	8	2	1	0
Question F	1	2	3	4	5
Pre score	9	2	1	1	0
Post score	10	2	1	0	0
Question P	1	2	3	4	5
Pre score	0	0	1	4	8
Post score	0	0	0	2	11

Figure 4.5: Table of tallies comparing student responses to action competence questions in the Questionnaire before and after the camp. The green colour represents the most sustainable answer, red represents the least sustainable answer. The numbers in the coloured squares

correspond with the numbers used on the semantic differentials scale in the questionnaire.

Within the tallies of scores in the three questions pertaining to action competence, there is only a slight movement overall towards action competence in questions E and F (regarding whether students feel like they can make a difference and whether people should get involved in decision making or leave it up to the government/council). There was, however, an overall strong movement towards more action competence in question P (three students moving to strongly action competent), which meant that more students identified with the statement "I think that if we make smarter decisions as a species we can make the world a better place to live in". This goes to show that some students have improved their optimism about the future and have fostered values more conducive to action competence. One reason that not a lot of students showed improvement in their action competence is because a lot of them already showed a tendency towards action competence on the scale provided and had little room to improve. If we look at *Figure 4.5* we can see that the vast majority of students (an average of 11 students) are on the green or sustainable side of the spectrum, whereas there is less than one student on average who had an initially unsustainable viewpoint. Evidently, there was not a lot of room to improve on the sustainability intentions or action competence of these students.

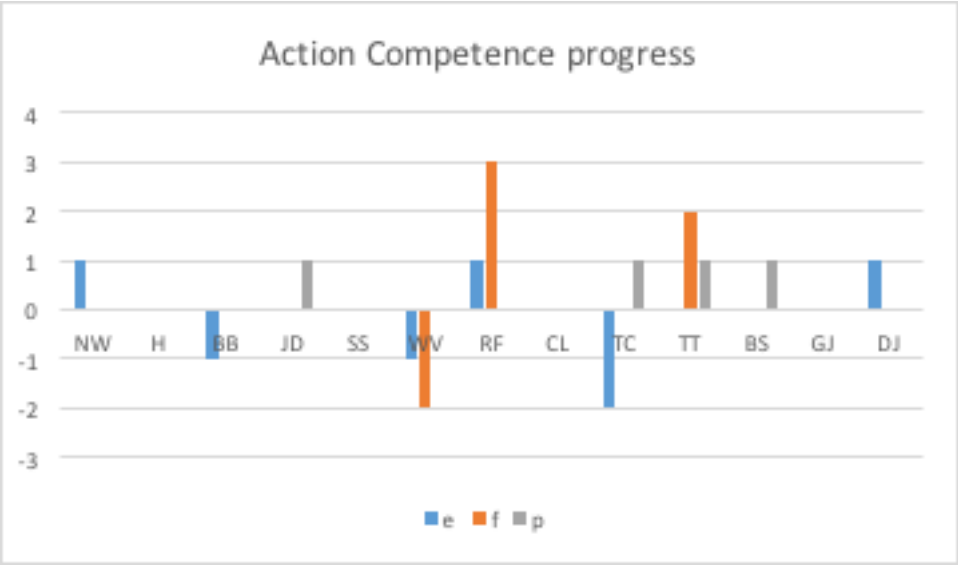

Figure 4.6: Graph showing individual action competence progress across the 3 related questions within the Questionnaire. The different colors are attributed to the letters e, f, p, which are the statements from the questionnaire. Positive numbers reflect a move towards the action competent

statements from pre-post, the negative numbers reflect a move away from action competent statements. Listed are the sustainable statements, E: I believe that I can make a difference in the world by taking action on sustainability issues, F: I believe that getting involved in decision-making (e.g. voting, protesting for what you believe in) is everyone's responsibility, P: I think that if we make smarter decisions as a species we can make the world a better place to live in.

Together, the individual students' progress in the 3 questions pertaining to action competence (*Figure 4.6*) show an overall increase in action competence and several individuals stand out as having reported (or not reported) a change in intention. The students who made the most change were RF and TT, particularly in question F (regarding whether people should get involved in decision-making or leave it up to the government/council). These students gained confidence in the concept of active democracy, perhaps after meeting local protest leaders and Tangata Whenua. This change in intention could be attributed to the fact that students had no idea of the concept of active democracy prior to the camp.

Four of the 13 (JD, TC, TT, BS) students moved towards the more action competent statement (by 1 point) in question P, signaling that they were more optimistic about their active role in the making the world a better place. Three of the 13 students (NW, RF, DJ) moved towards the more action competent statement in question E which means that these students believed more strongly that they can make a difference in the world.

There were four students who appeared to make no movement whatsoever in their action competence (CL, GJ, SS, H), which was due to their already high level of action competence on the scale used, meaning that they had no room to move. BB, WV and TC made movements away from the sustainable answer in question E (regarding whether students feel like they can make a difference) and WV was the only student to make a movement away from sustainability in question F (regarding whether people should get involved in decision making or leave it up to the government/council). The reason for this move away from the more action competent view is unknown, perhaps for some reason these students saw it fit to put more trust in local governance. Either that or they were dispirited by the lack of action on the camp and felt like they were never making any difference so they may as well leave it up to someone else. This provides information on the structure of the camp and lends credibility to the idea that there should be at least some form of action, so as to avoid feelings of despondency (Hicks & Bord, 2001).

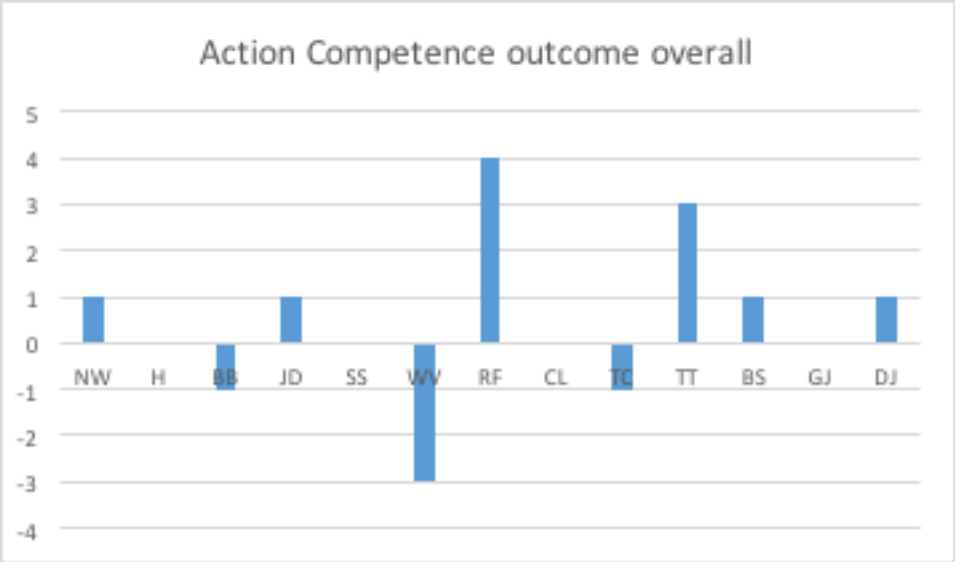

Figure 4.7: Graph showing the overall movement of students towards or away from action competence statements. Calculated by averaging the students' progress across three action competence questions within the questionnaire. Positive numbers indicate movement towards action competent statements, negative numbers indicate movement away from action competent statements.

As can be seen in *Figure 4.7*, the individuals who improved the most in perceived action competence overall were individuals RF and TT. The student whose action competence decreased the most was WV (who also made very little change in sustainability literacy). TC also moved away from action competence in question E (regarding whether one person can make a difference). Coincidentally, TC was the student who increased their sustainability literacy the most (by a large margin). This shows that he/she has developed sustainability values but not the confidence in his/her own ability to make a difference, although he/she has the optimism that others can make a difference.

The focus group interviews had a series of questions designed in student language to gauge the development of action competence, such as: 'If you encountered a sustainability issue such as mining in the Karangahake Gorge that really meant something to you, do you feel confident that you could do something about it? How would you go about it? What might stand in your way to being successful?' Most students came up with viable courses of action when confronted with a sustainability issue, for example: BS: "If there was enough people with a big petition I feel like that would start a movement", H: "Call DOC", RF: "Write a letter to the council". Interestingly, TC was despondent and thought that it didn't

matter what was done – it would have no effect: “I don’t think I could do anything because I don’t think it could be prevented, it’s up to the government and council to prevent it”. This aligns with TC’s stance in the questionnaire in that he/she felt that their personal efforts would make no difference. WV (who moved to being less action competent following the intervention) commented that he/she could make somewhat of a difference (“Yeah somewhat, I feel like I couldn’t do it myself but I’d have to contact someone of that area who has authority who could try do something”), which was at odds with their response in the questionnaire, and may have been an effect of the focus group interview they were in.

The questioning within the focus group interview also attempted to locate barriers to action competence and was quite revealing in showing that students generally feel disempowered. Students commented that they feel like they have no voice and will not be taken seriously if they stand up for something. GJ: “People will just be like “oh, they’re school children, they don’t know what they’re talking about” and WV: “We’ve got no authority as well ‘cos we’re just young kids, we feel like people don’t take us seriously and they wouldn’t consider our opinions as much as they would adults’”. Aside from their age, students acknowledged that they would need better scientific data in order to be taken seriously: NW: “Yeah, it’s the evidence, it’s really hard to get a clear answer, looking at what we got, there was different answers on whether mining was bad or not”. This is a positive sign that students have a good understanding of what makes data trustworthy, which is a requirement of action competence in this context. Another sentiment revealed in questioning was that students felt as though all decisions were based on money, for example GJ: “They’re focussed on the money, rather than the people or the environment” and SS: “you wouldn’t have the power to stop anything, you’d have to go straight to the government and the council and question what they are doing. But they don’t really care because all they see is money”. Lastly, one student was insightful enough to see through everything and find the root cause of the problem, an important aspect of action competence (BS: “It’s not the miners’ fault they’re just doing their job y’know, it’s the council’s fault, the council should be getting grief, not the miners. The people that have gone up to protest actually need to protest to the council”).

4.5.1 Summary of action competence progress

The majority (11/13) of students showed indications of intentions to act before the camp that could be deemed already 'action competent' and therefore had little room to improve (by moving towards the more action competent statement). This meant that there was statistically very little improvement in the measures of action competence. However, certain individuals did make an improvement in their personal action competence indicators. Six students appeared to improve their action competence between the beginning and end of the camp. Individually, RF and TT made the biggest steps towards action competence, changing their minds from one statement (non-action competent) to another (strongly action competent). These students gained confidence in the concept of active democracy, became more optimistic about their active role in making the world a better place and a stronger belief that they can make a difference in the world. There were, however, some students (BB, WV, TC) whose action competence appeared to decrease. WV had the largest movement towards non-action competent statements. This may have been due to the lack of action taken on the issue on the camp, which may have led to students feeling like they were not making any difference, so they may as well leave it up to someone else. This provides information on the structure of the camp and hints at the idea that there should be at least some form of action so as to avoid feelings of despondency (Hicks & Bord, 2001). The fact that TC was one of the students who decreased in action competence was interesting, because he/she made the most progress in increasing his/her sustainability literacy.

When confronted with a sustainability issue students were easily able to brainstorm possible actions and to decipher the differences between symptom and cause. Generally, students felt disempowered and commented that they didn't have a voice in society, which they were not happy about.

4.6 Development of knowledge

Knowledge is another aspect of sustainability literacy specific to the context. Student development of knowledge was measured through three ways: the pre/post questionnaire, the focus group interviews and through the students' NCEA assignments (see section 4.7).

Pre vs Post median scores, Knowledge			
Question	Pre	Post	Change
G: Understanding of connection between land use and stream health	2	1	1
H: Understanding of how to clean up a waterway	3	2	1
I: Understanding of purpose of mines	2	2	0
K: Understanding of effects of mining on living things	3	2	1

Figure 4.8: Pre and Post median scores pertaining to knowledge. Green indicates a shift towards the more sustainable answer.

As can be seen in *Figure 4.8,* median pre/post scores of students in the questionnaire revealed that nearly all (3 out of 4) mining knowledge and water quality knowledge questions showed a change in self-reported knowledge over the course of the camp. This is indicative of students gaining knowledge of stream ecosystems, stream management, mining knowledge and the links between mining and the surrounding environment from the camp.

Tally of Individual answers					
Question G	1	2	3	4	5
Pre score	1	7	2	2	1
Post score	10	3	0	0	0
Question H	1	2	3	4	5
Pre score	0	6	3	2	2
Post score	4	7	2	0	0
Question I	1	2	3	4	5
Pre score	2	6	5	0	0
Post score	6	5	2	0	0
Question K	1	2	3	4	5
Pre score	0	2	5	4	2
Post score	4	8	1	0	0

Figure 4.9: Table of tallies comparing student responses to self-reported knowledge questions in the Questionnaire before and after the camp. The green colour represents the most sustainable/knowledgeable answer, red represents the least sustainable/least informed answer. The numbers in the coloured squares correspond with the numbers used on the semantic differentials scale in the questionnaire.

The Table of tallies (*Fig.4.9)* shows a large change towards the sustainable/knowledgeable answer in question G (9 points). Interestingly questions H, I and K all had similar increases in the number of 'most sustainable' answers (1 on the scale). The obvious reason that question 'I' did not show a median increase is because students already reported having a large amount of prior knowledge in that area (understanding the purpose of mines). Despite having no median increase, seven students out of 13 moved towards understanding why we have mines and

only one shifted away (CL) (see *Figure .4.10)*. So, even though the median score showed no increase in self-reported knowledge (*Figure 4.8)*, there actually was an increase in knowledge in 7/13 students *(Figure 4.10)*. The remaining five students did not change their original answer. Four of these students (H, JD, TC & TT) had already chosen the most knowledgeable answer, RF chose the neutral answer (3) both times.

Question K showed increased knowledge of the effect of mining on living things when looking at the median scores (*Figure 4.8)* and the individual knowledge scores (11 moved towards more knowledge, none away) (*Figure 4.10)*. Question G showed an increase in median scores and 10/13 students moved towards the more knowledgeable answer (*Figure 4.10).* This shows that the majority of students' self-reported having knowledge of the connection between land use and stream health. Question H also showed an increase in median scores and 10/13 students self-reported having a greater knowledge of how to clean up a waterway (*Figure 4.10)*.

Several students were prominent in the data as having reported large improvements in their knowledge. NW went from self-reporting very little prior knowledge about water quality in question G (4) to confidently stating that he/she knew how waterways are affected by land use (1). DJ reported the same change in knowledge, from 4 to 1. TC reported a similar jump in understanding – from 5 (knowing nothing) to 2 (relatively confident). Two other students (BB & GJ) moved by two points, from 3 (knowing a little) to 1 (knowing a lot). Responses to question H (knowledge of how to clean up a waterway) revealed that TC moved three places from 5 (having no idea on how to clean up a waterway) to 2 (having some ideas on how to clean up a waterway). DJ also moved three places from 5 to 2. Within question K (knowledge of how mining affects living things), JD moved from 5 (no idea how mining affects living things) to 2 (some idea), GJ moved from 4 (not sure) to 1 (very sure how mining affects living things) and DJ moved from 5 (no idea) to 1 (very knowledgeable) which was the largest shift in self-reported knowledge. These reported improvements in knowledge were far greater than those seen for other aspects of sustainability literacy.

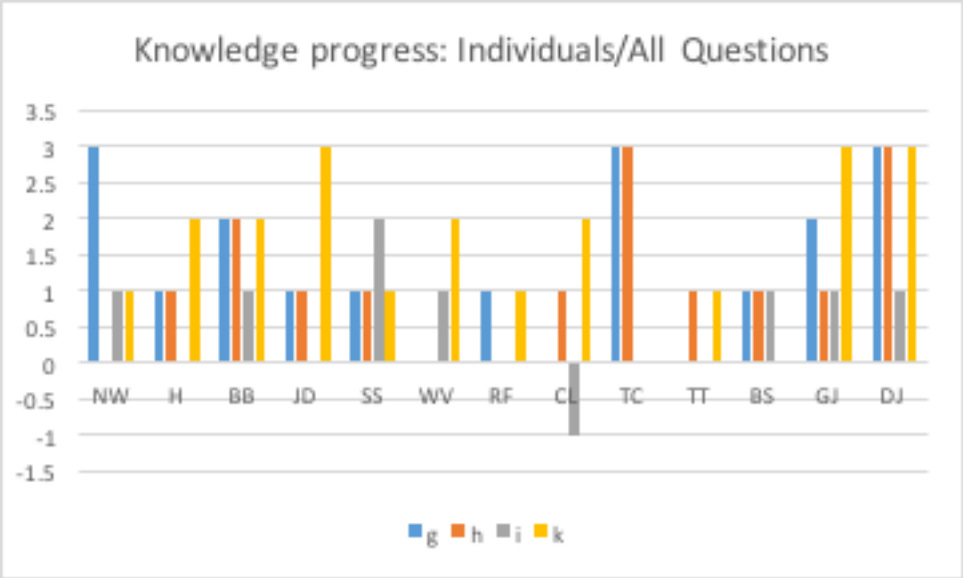

Figure 4.10: Graph showing knowledge progress in individual questions per student. Colours correspond with letters in the key (g, h, i, k) which are questions in the questionnaire. The most knowledgeable statements are listed: G: I can discuss multiple ways that a waterway can become unhealthy for living things based on the surrounding land uses, H: I can suggest multiple ways to clean up a waterway that is unhealthy for living things, I: I understand why we have mines, K: I can discuss how mining affects living and non-living things.

Within *Figure 4.10,* the positive numbers relate to increased self-reported knowledge, the negative numbers to reduced self-reported knowledge. There is a definite trend towards improved self-reported knowledge, with several students standing out as having made exceptional progress. DJ, GJ, BB & TC all reported having made an increase in knowledge of at least 6 points. All of these students started with relatively low levels of knowledge in comparison to their peers. Within *Figure 4.10* there is one prominent variance in the data - a reported loss of knowledge for CL in question 'I'. This reported loss of knowledge in question 'I' may have been due to the wording of the question – CL may have been indicating that he/she cannot understand why we have mines – rather than reporting a lack of understanding around mines themselves, which would account for the discrepancy. Overall, when you take student progress across all questions into account, the findings show that all students felt that they had improved their knowledge (*Figure 4.11)*.

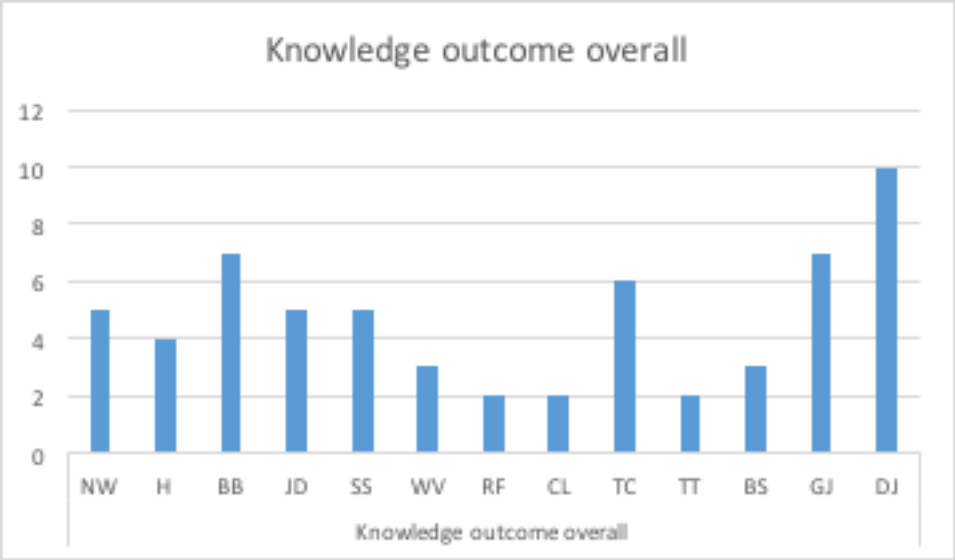

Figure 4.11: Graph showing overall knowledge outcome. This was calculated by averaging the scores across all knowledge questions per student. Student pseudonym initials are listed, as is the numerical increase that they made in knowledge of mining and water quality. Positive numbers are attributed to movement towards statements in the questionnaire that show more knowledge of mining and its impacts and water quality.

As seen in *Figure 4.11*, the students who felt that they had made the biggest improvements in knowledge were TC, GJ, BB and DJ. Coincidentally, these were also the students whose comments in focus group interviews showed that they had connected with the area and gained an appreciation of the place. DJ and TC both commented in their focus group interview that they enjoyed the learning aspect and this enjoyment of the learning likely led to the creation of knowledge (Covell, McNeil, & Howe, 2009). TC was also the student who had the biggest improvement in sustainability literacy out of the group and one of only three students to have decreased action competence. This suggests a link between enjoyment, learning and sustainability literacy, but not with action competence. This may have been because we did not actually take action for or against the issue as part of the camp.

Within the focus group interviews, a similar trend was seen: students felt that they had substantially improved their knowledge of water quality and mining. When asked if they understand how different factors show how healthy a stream is, all students said "Yes! A lot, definitely." Others elaborated on their experience, such as DJ: "Yeah, I learnt a lot from that camp" and BS: "I have a very good understanding". One student even mentioned how he/she had passed on the knowledge: SS: "I didn't know anything when we first started, I was talking to my mum about biological scores last night and had to explain what it meant". The same

student was interested in testing other freshwater areas that he/she frequented to see how healthy they were: SS: “We should check the water quality at McClarens”. This same student asked me for the contact details of the council so that he/she could borrow some water testing equipment over summer. This enthusiasm shows an obvious interest in the topic which has been fostered by the camp.

When students were asked in the focus group interviews whether investigating water quality helped them to make their mind up on the issue of mining, there were a range of responses (8 said yes, 5 said no), which was likely due to the mixed results that students got in their stream surveys. On camp we talked about the vagaries of results in ecological studies. Some of them were disappointed that they did not get the outcome that they expected – it was a good opportunity for them to learn about the nature of science – that you have to be objective, let the results speak for themselves, compare data, do repeats and be objective (*PO*). This was echoed in the students’ comments: NW: “We found out that mining was affecting the stream in a bad way, but a lot of people didn’t. If the results had been more clear, I think it would have helped”. Many students commented that they had learnt a lot from the investigative process: DJ: “Yes and no, I never knew what impact it actually had but it’s changed now, ‘cos I know it actually will have an impact on the water quality” and TC: “Yeah definitely, we had good results that backed up the fact that it’s a bad idea”. Students also absorbed the revelations in our talks about the nature of scientific studies, later commenting on how to improve the accuracy of their findings: BS: “I feel like if we had done more tests then we would have got a better idea”, SS: “Yeah we needed to do more repeats to make it a fair test” and CL: “Yeah by having more repeats. It was pretty hard with our results because they were different from what we expected”. This process of learning about the nature of science was valuable for students and an important part of their developing sustainability literacy (Jensen & Schnack, 1997). Students have to know whether their data is valid or not if they are to make informed decisions based upon it. With more data, students would be able to more conclusively tell whether mining was having an effect on the freshwater ecosystem.

4.6.1 Summary of knowledge development

Findings from the questionnaire and focus group interviews showed that all (13/13) of the students made improvements (a class average of 4.7 points improvement) in

their self-reported knowledge level of mining and water quality. There was also an increase in the median self-reported knowledge score for three out of four questions. This is a much larger improvement than seen in the other areas of sustainability literacy, attitudes/values had a class average of 1.3 points improvement and action competence had a class average of .46 points improvement. The large improvement in self-reported knowledge is likely due to the fact that most students had very little prior knowledge of water quality and mining prior to the camp, so they had a lot of room to improve. This was not the case for sustainability literacy (attitudes/values) and action competence, as students already had quite well-formed sustainable ideas in these areas. The knowledge increase is also likely due to the focus of the camp being perceived (by students) to be on the achievement standards, perhaps at the expense of the more holistic aspects of Sustainability and Place (such as knowledge of culture and history of the area). A positive relationship was indicated between connection to place (Karangahake) and self-reported knowledge improvement. Interest and engagement in the topic also led to apparent increased knowledge.

4.7 NCEA Achievement

It was important that students were able to gain a high standard of achievement in NCEA whilst learning in the method that I designed. For schools to accept a method of teaching that is different to the status quo and requires work to implement, it must be shown to be able to keep up with or improve upon the level of achievement that students would gain in a traditional classroom environment (Eames, Cowie & Bolstad, 2008). Without an indication of NCEA achievement, my study could not be used as a framework for further courses without significant revision. I measured NCEA achievement by looking at the marks that students received on the assignments for two Science achievement standards that they completed whilst on camp (AS90925: Practical investigation in a Biology context, AS90951: Investigate the Biological impact of an event on a New Zealand ecosystem). These marks were then compared against the grades that they received in a similar Level One Science achievement standard that was completed at school several weeks prior. As the students were in Year 10, there were few previous NCEA Science results to compare with the results gained in the achievement standards on camp.

The results that students gained in the NCEA Science achievement standards completed on camp are below in *Figure 4.12*.

Results from Achievement Standards		
Name	AS90925	AS90951
NW	E	A
H	M	M
BB	E	A
JD	M	E
SS	E	M
WV	E	M
RF	E	M
CL	E	E
TC	M	M
TT	E	M
BS	E	E
GJ	E	E
DJ	E	E
Median	E	M

Figure 4.12: Table showing student grades and median grades across the two Science Achievement Standards (AS90925 and AS90951) that were completed as part of the camp.

Students gained higher grades in AS90925 (Excellence average) than AS90951 (Merit average). This could be due to the fact that AS90925 is essentially a fair test/pattern seeking investigation in a biological community (measuring living things) which the students have practiced repeatedly in Year 9 and Year 10 in the Science skills development programme at their school. They are very familiar with the structure and expectations of such investigations and anecdotally they found it fairly straightforward (*PO*).

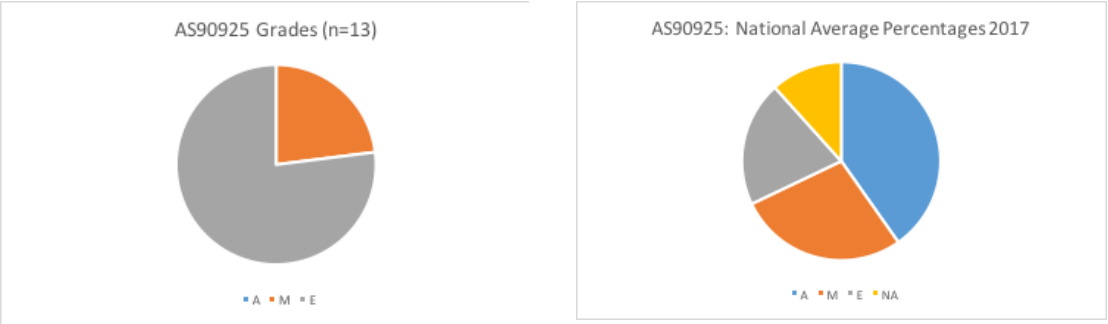

Figure 4.13: Pie graph showing percentages of students gaining Achieved, Merit, or Excellence in Achievement Standard 90925: Carry out a practical investigation in a biological context, with direction. Excellence grades are denoted by the colour grey, Merit by the colour orange, Achieved by the colour blue.

As can be seen in *Figure 4.13*, most students gained an Excellence in this AS90925 (77%) with 23% achieving a Merit grade and 0 students getting an Achieved or Not Achieved. It is also evident that students on the intervention gained far more Excellence and Merit grades than the National average and no Not Achieved (fail) grades.

Figure 4.14: Pie graph showing percentages of students gaining Not Achieved, Achieved, Merit, or Excellence in Achievement Standard 90951: Investigate the biological impact of an event on a New Zealand ecosystem. Excellence grades are denoted by the colour grey, Merit by the colour orange, Achieved by the colour blue.

As can be seen in *Figure 4.14*, most students gained a Merit (46%) in AS90951, closely followed by Excellence with 39%, and two Achieved results which equates to 15% of the total grades.

According to the marker's report, the lower average grade in AS90951 can be put down to students missing vital assessment criteria. In particular, students did not go into enough depth on internal biological processes within invertebrates. The performance in AS90951 was poor in comparison to AS90925, but compared to national averages in Y11 Science (as can be seen in *Fig. 4.14*) the students achieved at a high level with more Excellence and Merit grades. AS90951 was different to AS90925 in that it required a lot more elaboration and specific scientific knowledge. Rather than a straightforward investigation into finding patterns in a biological community, AS90951 was about finding trends in abiotic (non-living) factors and explaining why the patterns existed, how they impacted on living organisms and how they impacted the ecology of the waterway. The main reasons given by the marker as to why students failed to gain Excellence was due to their limited explanations of how the organisms were affected by the changing environmental factors and how the ecology of the river at large was affected. Students had no prior knowledge to draw upon in this area and everything was

learnt in situ (with a lot of content to learn in 7 days).

Comparing performance in camp standards to a standard done at school

In order to judge whether the camp was beneficial or detrimental to student achievement, it was necessary to compare the results that students gained on camp to those gained in the classroom. AS90930 was a Science standard that students had already completed that I used for a comparison due the fact that it was in the same subject area and had a very similar structure to the AS90925 which was completed on camp.

About AS90930: This achievement standard is about rates of reaction between two different substances. Essentially, students have to plan and carry out a fair test in the lab to work out the factors that increase the rate of reaction, then explain why the factors sped up the reaction. It is highly structured and students get a lot of practice before doing the assessment. The content is not new – it is knowledge that students have been taught as part of the Year 9 and 10 curriculums. Students plan alone, then work in groups of three to carry out the investigation, then finish solo.

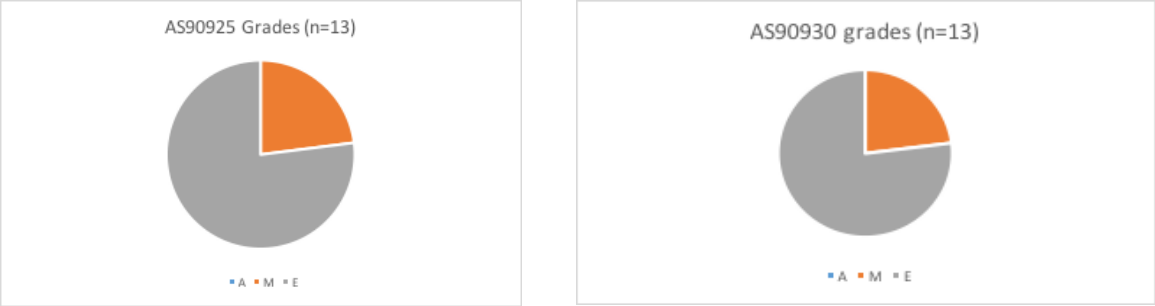

Figure 4.15: Pie graphs comparing performance in AS90930 (school based) with performance in AS90925 (completed on camp). Data shown is from the exact same students as were on camp, not a class average.

As can be seen in *Figure 4.15*, performance in AS90930 was identical to the performance of participants in AS90925. AS90930 is very similar to AS90925 in that both of them are fair test/pattern seeking investigations of which the students have done countless times. The fact that students got the same grades provides evidence that the intervention has not adversely affected their grades. AS90930 was completed in a classroom over a period of 4 weeks, which equates to 16 hours of class time. Students were given the chance to do practice assessments and get feedback on them, to complete homework, access the internet and to talk to students

who had done the assessment before. The learning method was vastly different, for AS90930 they were solely based inside, the teaching method was simply a transmission of information and the teacher and students knew what to expect before they even did the experiment (can it even be called an experiment if you know what is going to happen?).

4.7.1 Summary of Achievement

Students were able to maintain their usual standard of achievement in comparison with another Science achievement standard done in the school environment just prior to the camp. This provides evidence that the camp design and implementation is not detrimental to student achievement in NCEA. Achievement in Science was not the primary goal of the camp; the goal was to foster sustainability literacy in an engaging way whilst completing an NCEA standard. One aim of the camp was to explore the idea that school could be something more than just churning through achievement standards. At school, a high level of student achievement is the goal, the centre-point of all pedagogical decisions, whereas on this camp, the results were simply a by-product of the students' engagement with and enjoyment of learning. The focus was elsewhere. The way that students learnt on this camp had many more significant benefits to the students aside from them just passing another achievement standard. And because the focus was not on results, students felt less stress and pressure to perform (*FG*).

4.8 Links between different aspects

There were links revealed between the results gained in the NCEA achievement standards completed on camp and engagement, enjoyment and student progress in sustainability literacy, action competence, connection to place and development of knowledge. Evidence of this was seen in several individuals.

Evidence of a positive relationship between self-reported knowledge gain and NCEA results is seen in the grades of individuals DJ (the largest increase in reported knowledge and the joint highest NCEA grades) and GJ (the second largest increase in reported knowledge and the joint highest NCEA grades). It is not surprising that an increase in knowledge has led to a predilection for achieving in an achievement standard in which said knowledge was required.

Evidence of a positive relationship between sustainability literacy attitudes/values and action competence was only seen in TT, which is not enough to suggest that this is a consistent factor in either result. However, action competence is a component of sustainability literacy, which may explain this result. Also, as has already been established, there was little room for students to improve in both sustainability literacy attitudes/values and action competence which affected the

progress scores. This is a design flaw of the survey – progress is the only factor that was measured which gave no significance to prior knowledge/attitudes/values. For this reason, I investigated and presented the raw data tallies.

Evidence of a positive relationship between sustainability literacy and success in NCEA was seen in several individuals. TT made a large improvement in sustainability literacy (2nd largest improvement) and did well in the NCEA assessments (joint second place with an E and an M), as did CL, who had the 3rd largest improvement in sustainability literacy and achieved joint first place (with an E and an E) in the NCEA assessments. These particular students attained identical results in their school based standard.

Evidence of a positive relationship between action competence and NCEA achievement was also seen, with the top two improvers in action competence (RF & TT) both gaining joint second place overall in the NCEA assessments. These relationships are promising as they provide evidence that not only does having sustainability ideas embedded within a course not hinder grades, it may even serve to help the student's level of achievement if implemented correctly. There was no evidence to support a positive relationship between sustainability literacy development and knowledge development, nor between action competence and knowledge development.

Having an appreciation of the place (Karangahake), enjoying the experience and engaging in the learning may have led to improvements in sustainability literacy, action competence and student achievement – but there is no way to confidently make this conclusion due to the nature of the data detailing student experience and connection to place.

4.9 Summary of findings

By triangulating my data, I was able to find indications of several trends within the evidence gathered via observation, focus group interviews, questionnaires and students' work. Student experiences on camp were overwhelmingly positive, many commented on how they preferred/enjoyed the style of learning, that the camp setting helped them to forge friendships and break down social barriers and that they enjoyed the natural setting and the opportunities that it provided. Students were engaged with the style of learning and preferred learning outdoors and learning

through the issue of mining. Students also appreciated having time to acclimatize to the environment and having some focused skills lessons so that they could operate within the environment comfortably. Many commented that the environment was less stressful and that on camp there they felt no pressure to perform academically, socially, or culturally.

Sustainability literacy attitudes/values did increase overall, but only in 5/11 of the criteria. This may have been due to the fact that many students exhibited a high level of sustainability literacy through the pre-camp questionnaire, therefore there was very little room for them to show improvement during the camp. Seven individuals appeared to improve their sustainability literacy attitudes/values, two demonstrated less sustainability literacy following the camp and four showed no change overall. There was a wide variance in how much individual students showed improvement. It was revealed in student comments that living communally in the camp appeared to be of benefit to sustainability literacy attitudes/values – as the nature of communal living can breed tolerance, community and cooperation.

No development of action competence was recorded when looking at the median data across all students. Again, this may have been due to many students already exhibiting a high level of sustainability literacy. Overall, six students appeared to improve their action competence, three indicated having less action competence following the intervention and four showed no change. Of the students who showed less action competence following the camp, there is potential that they were dispirited by the lack of action taken on the camp. For future interventions such as this, I would suggest a longer time period to allow for some form of action (as to avoid potential despondency).

Development of knowledge was an aspect that all students improved in. Again, knowledge improved more in some students than in others. A connection was seen between knowledge development and connection to place. Students' development of connection to place was evident in observations and student comments in focus group interviews. All had significant 'places' that they identified with and mentioned that they appreciated the area much more than they did prior to the intervention. NCEA achievement was on par with students' previous results in Level 1 NCEA Science and far above the National Average.

There was some evidence of a positive relationship between different aspects of the

study (knowledge and connection to place, knowledge & NCEA results, sustainability literacy attitudes/values & NCEA results, action competence & NCEA achievement), however, other aspects showed no positive relationship (sustainability literacy & action competence, sustainability literacy development & knowledge development, action competence & knowledge development). Other aspects (such as those relating to human experience) could not be confidently connected to others due to the nature of the data. With more data I may be able to further examine relationship and causality between these different aspects – this cannot be reliably done with my small sample size and the nature of my data.

5. Discussion, Conclusion and Recommendations

5.1 Chapter overview

In this chapter the findings of the research are discussed, explained and extrapolated. The structure of this section is determined by my three research questions:

1. What are the student experiences of a school camp based on PRE, IBE, Outdoor Learning & EfS principles?
2. How does an issues based, outdoor camp based on EfS and PRE principles affect the sustainability literacy of student participants?
3. What is the contribution of an issues based, outdoor camp based on EfS and PRE principles to student achievement?

Discussion of these research questions includes comparisons to previous research, conclusions of the research, implications of the research and recommendations for further research. The purpose of this discussion is to inform my own teaching practice in EfS, to provide advice for other practitioners of EfS and to propose avenues for further research to improve EfS pedagogy and implementation.

5.2 Student Experience on camp

1. What are the student experiences of a school camp based on PRE, IBE, OL & EfS principles.

The design of this camp was based around four different theoretical frameworks – Outdoor Learning, Issues Based Education (IBE), Place Responsive Education (PRE) and Education for Sustainability (EfS). I synthesised these four approaches in order to create a camp that engaged students in learning EfS principles whilst maintaining the achievement requirements of a contemporary New Zealand secondary school.

Within the findings chapter, student experience was broken up into several categories – Engagement, Enjoyment and Connection to 'place'. These three categories are synthesised within this section in order to provide a holistic sense of

student experience. I have noticed after many years in New Zealand secondary schools that many students are engaged but not necessarily enjoying their learning. It was my challenge to create a course where students could be engaged and enjoy their learning. If students are engaged and enjoying their learning, many of the problems currently occurring in schools (poor attendance, poor achievement, behavioural problems) will diminish (Antaramian, Huebner, Hills, & Valois, 2010). Engaged students who are enjoying their learning are far better behaved, more receptive to ideas (like EfS), kinder, more curious, and more respectful towards one another (Gallup, 2013; Marks, 2000; Taylor & Nelms, 2006).

I have also noted that many students do not care (or appear to care) about the 'environment', that they lack an ethic of care and an understanding of 'Sustainability'. Connection to place is important, as it is the first step towards sustainability literacy and action competence – hence why it was explored whether a connection to place developed within the students. Without connection to place students would not be able to access all of the benefits inherent within EfS and IBE. Students do not engage in critical studies as successfully without first caring about the area itself (Rose & Cachelin, 2014).

The experience of students on this intervention was carefully designed. Overall, the student experience towards the structure and pedagogy of the camp was positive, which means that it can be used again by myself and others wanting to create a similar experience. This is one of the strengths of the EfS approach described in my methodology –adaptability to suit a wide range of students, environments and contexts. Whether this intervention could be repeated with the same findings is questionable, as student experience is dependent on so many factors.

The stage was set for cultivating an experience rich in engagement/enjoyment/sense of place far before the camp began. By co-constructing the camp with the students and involving them every step of the way students had ownership over the experience – as they had been involved in its creation. Students reported that they enjoyed being involved in the construction of the camp, felt as though they were included in decisions and that their opinion was valued. In contrast, students commented that they usually felt disempowered at school, that they did not feel as though they had a voice in society, which they were not happy about. The

implication of this and a consequent recommendation is that co-construction should be utilised in further teaching of EfS as it contributes significantly to student experience. Doing so would redefine the power balance within the classroom and empower students – which has a roll on effect of improving engagement and enjoyment (Bishop & Glynn, 2000).

Learning EfS through the lens of a contextual issue (IBE) had many implications on the student experience. IBE was viewed as more engaging and enjoyable in comparison to out of context learning/compartmentalised learning by students on the intervention. The fact that students had a voice in choosing the issue was appreciated by students and likely resulted in more engagement due to them having ownership over the topic and ensuring its relevance (Levin, 2000). The approach taken (in having students choose a class-wide issue) has the benefits of being easier to manage for the educator as well as fostering negotiation and compromise within students. The downside is that students did not get to pursue the specific areas of interest that they discovered within the study. From an educators' point of view, juggling individual projects is much more work and may serve to foster individualism which is contrary to the objectives of EfS (Pappas, Pappas & Sweeney, 2015). Individual projects conflict with the social-constructivist roots of EfS where social learning is highly valued. The recommendation therefore is to have students collaborating on issues in small groups of 3-5 students (Kooloos, Klaassen, Vereijken, Van Kuppeveld, Bolhuis & Vorstenbosch, 2011; Springer, Stanne & Donavon, 1999). Students did work in groups on the intervention, but the issue was not a group-negotiated decision.

Also, given that students needed to connect with the environment in order to identify issues that resonated with them it is recommended that introductory camps within an EfS course take place in a negotiated environment in which students can be introduced to a number of issues. This way students can have more choice in the issue that they pursue and this will likely result in them revisiting the site to pursue the issue which leads to a stronger connection to place (Payne & Wattchow, 2008).

Students self-reported that they enjoyed learning outdoors and were engaged with outdoor learning far more than in a comparative traditional (indoor) school setting. Findings showed that this was due to the 'hands on' nature of the intervention which was in the context of a real life issue. The implication of the student experience in

this regard is that there is not enough balance between indoor and outdoor learning at school. Student comments revealed that they were bored of always being indoors and the indoor environment was therefore hindering their enjoyment of learning. This is not a local phenomena, the same can be said of many students worldwide (Dillon, Rickinson, Teamey, Morris, Choi, Sanders & Benefield, 2006). Within the pedagogy described in this intervention outdoors have a much more prominent place in the curriculum – requiring a lot more education outside the classroom (EOTC), which is currently hindered by the traditional pedagogy and pressures of assessment driven education common to New Zealand secondary schools. Research has shown that the most effective way to allow for more EOTC is to implement pedagogical change towards a more holistic educational model such as EfS by implementing a 'whole school' approach (Henderson & Tilbury, 2004; Sustainable Aotearoa New Zealand, 2009). There is, however, a lot of institutional resistance to change in this regard (Elley, Hall & Marsh, 2004). Historically, EOTC has not only been difficult to implement but it has not been valued for its holistic benefits (Zink & Boyes, 2006). A pedagogy with an emphasis on connecting with the outdoors (such as EfS) would arguably be far more beneficial to students, teachers and society as a whole (Kopnina, 2014).

Students were eased into the 'Outdoor' environment (via having an acclimatisation period) and the assessment – which students appreciated and preferred. The flow of the intervention (in allowing students an acclimatisation period before engaging critically) worked well to foster a sense of place/environmental ethic, which acted as the foundation for a more critical approach. Surely EfS, PRE and IBE cannot truly be effective if taught predominantly indoors as this sense of place will not develop in the classroom. It is therefore recommended that all learning in EfS has an acclimatisation/exploratory period within the contextual environment, without the 'pressure' of the issue getting in the way of people emotionally connecting with the place first. Other researchers have referred to this as 'slow pedagogy', essentially easing students into their learning and removing a lot of the pressures and stresses associated with today's learning environments (Payne & Wattchow, 2008; Tooth & Renshaw, 2009). Having an acclimatisation period can be applied to any issue, in any environment – the point being that students need to experience the place that the issue is concerned with to connect with it and gain a deeper, more holistic understanding.

Individuals developed a strong emotional connection (sense of place) with Karangahake based on their shared experiences and the natural beauty of the area. Students all connected with the place for individual reasons – there were shared experiences that were commented on but each student had their own unique places that meant something to them with distinct reasons for connecting with them. However, there were very few mentions of the cultural/historical values of the area as reasons why the students appreciated the area. This is a vital part of the holistic concept of place in PRE and 'environment' in EfS which students did not comprehend (Lugg, 2007; Pappas, 2012). This may have been due to the focus of the camp being mostly based around the effect of the mining on the stream ecosystem, without enough focus on the holistic aspects of the environment (history, culture). The focus on the effect of mining on the stream ecosystem was directed somewhat by the requirements of the two NCEA achievement standards that the students completed and therefore both the students and I potentially put too much emphasis on this aspect. The implication here is that culture and history need to take more prominence within future teaching of EfS. To do so, it is recommended that future EfS focusses on stronger collaboration with local iwi (indigenous people), providing students with more cultural/historical learning opportunities as recommended by Bequette (2014) and Rishel and Zuercher (2016). The fact that students missed out on understanding the more holistic elements also serves as a warning that including an assessment can shift the focus of learning. The presence of assessments can make students strategic in their allocation of energy/time towards assessment relevant criteria at the expense of deeper learning goals. (Gibbs, 2006, p. 23).

The learning theories underpinning this intervention (Social-Constructivist, Humanistic, Socio-cultural) formed the foundation of the camp culture. The camp 'environment' was designed to be conducive to social learning. Because learning was flexible it was also inherently social, as students were not hemmed in by rules of when they could or could not engage with their peers. Students were able to interact socially within the 'outdoor classroom', which is the aspect that they most enjoyed. This implicates that learning is a social phenomenon and leads to more enjoyment/engagement in learning confirming the work of Vygotsky (1962). It also hints that engagement in/enjoyment of learning is strongly affected by having a

positive social environment to learn in. The recommendation here is that educators should concentrate on fostering positive relationships and a positive classroom culture prior to engaging with learning. A well-designed camp at the start of the year is the perfect place to do so.

The pedagogical approach taken by teachers was well received by students, indicating that a caring, supportive and facilitative approach is more conducive to student wellbeing. Parallel work in this field has found similar trends (Cornelius-White, 2007). Students commented that teacher support made the work more manageable and less stressful. Such an approach would be difficult to replicate in a classroom given that the ratio on camp was 1:5, at school it is often 1:30. The current culture in schools makes it difficult for teachers to take the role of a relaxed facilitator – there is not enough time and a rush to assessment. It is recommended that schools employ a more student centred curriculum (such as EfS) and a more flexible timetable (such as that employed on camp) so that teachers could have more time to engage meaningfully with students. In the pedagogy of EfS where students are engaged, supporting their peers and taking responsibility over their own learning they are far less reliant on the teacher. In this paradigm a 1:30 ratio could work. A study by Glasson, Frykholm, Mhango and Phiri (2006) showed that despite large class sizes being generally detrimental to learning - effective pedagogy in EfS can have a significant effect on raising sustainability literacy in spite of these conditions.

Findings showed that the camp setting led to students creating stronger friendships and socialising with different people than they usually would at school. Students mentioned that people behaved differently outside of school – that they were nicer, more open and more respectful. This highlighted the importance of positive relationships and positive daily interactions in the enjoyment of an experience. It also shows that the outdoors can provide an environment in which people are more relaxed and open socially and cognitively as found by Brookes (1989), Rickinson, Dillon, Teamey, Morris, Choi and Sanders (2004) and Arnold, Cohen, and Warner (2009). Some strong friendships were formed and the shared experience of camp brought the group together. In a camp environment the pressures of ‘normal’ school melted away. Replicating this camp environment may be difficult within a secondary school. That would require the whole culture of the school to change -

such as under a whole school model of EfS which has long been recommended as the most effective way to implement EfS (Henderson & Tilbury, 2004; Sustainable Aotearoa New Zealand, 2009). The more obvious implication here is that outdoor camps should be included at the start of the year in an effort to foster positive relationships. My findings also suggest that camps should be long (5-7 days) and should take place off the school grounds so that the pressures of school are non-existent. This aligns with the conclusions in a study by Sammet (2010) into outdoor experiences fostering positive social relationships between adolescent girls. An additional recommendation is that camps be run in smaller/more intimate groups of 10-15 students to avoid a similar culture to school where there are often 30 students to one teacher. One comment that really stood out was from RF, he/she said "I wish this camp was at the start of the year, I had no friends most the year and sat by myself". This student made strong friendships with a group of students on camp and was one of many students who were reluctant for the camp to come to an end. A similar trend was seen in the work of Sammet (2010).

Students also indicated that the 'assessment environment' encountered on camp (whilst actually requiring more work than they would do at school) was more relaxing, enjoyable and stress free than traditional schooling. Reasons given were that they could work at their own pace and it didn't feel competitive because their peers and teachers were supportive. On the camp students completed two NCEA achievement standards in the space of a normal school week (double the work rate expected from students traditionally taking Level 1 NCEA). This was in an attempt to link together two similar NCEA achievement standards in order to lessen the overall work that students would have to do compared to completing them individually. There are multiple implications that come out of this. It hints that selecting achievement standards that link together can significantly reduce the amount of work that students have to do and the amount of stress that students are subjected to. This is a well-known (and highly effective) but rarely implemented strategy within New Zealand secondary schools (Morey, 2008). Findings suggest that it may not be the amount of assessment that is causing stress in the traditional school environment, but instead the way that assessments are structured (out of context), the amount of assessments and the school environment itself, which is inherently stressful and full of expectations (academic, social, emotional & cultural) (Lugg, 2007).

5.3 Development of sustainability literacy

How does an issues-based, outdoor camp based on EfS and PRE principles affect sustainability literacy of student participants?

Sustainability literacy is a set of Sustainability 'checkpoints'. This intervention aimed to test a method of fostering sustainability literacy in an attempt to create a template for other educators to use. Sustainability literacy is a multifaceted concept that was divided into two sections within the *Findings* chapter – sustainability literacy and action competence. Sustainability literacy is essentially the pre-cursor or pre-condition to action competence but the two concepts are often treated separately in literature (Bishop & Scott, 1998). The original concept of sustainability literacy includes action competence as an integral component which is why both concepts are synthesised and summarised within this section. Below the findings are discussed in terms of their implications and recommendations, then compared to analogous research in the field of sustainability literacy.

Findings showed that the cohort of 13 students improved their sustainability literacy overall, but only in six out of fifteen areas. The median was misleading in that it did not take into account whether students had room to improve or not. Seven of the nine areas that showed no improvement because students had no room to improve, they already had a high level of sustainability literacy.

Students indicated having poor prior knowledge in the 6/15 sustainability literacy areas that showed improvement, were undecided in the 2/15 areas that decreased in sustainability literacy and had substantial prior knowledge in the 7/15 areas that showed no improvement. Evidently, having poor prior knowledge was an indicator of improving sustainability literacy over time. The implication of this is that in future studies it is recommended that the researcher first establish prior sustainability literacy in order to better target the areas that need addressing. This was not done prior to this intervention despite it being something that I employ in my everyday teaching and it being inherent within Social Constructivism pedagogy (Driessnack, 2009). In targeting specific areas of sustainability literacy, it is imperative to retain the holistic view of Sustainability, rather than including some areas at the expense of others. Perhaps it would be best to simply emphasize certain aspects to ensure their adoption by the students lest students think that there are not

links between the different aspects of sustainability literacy (Colucci-Gray, Camino, Barbiero & Gray, 2006). In a practical sense, educators could prepare optional workshops on the different aspects of sustainability literacy, and use student prior knowledge to inform them on which should be emphasized in the intervention (Somerville & Green, 2012).

I would also recommend that workshops are optional to preserve the democratic nature of the camp and to allow students with prior knowledge to join in and consolidate their knowledge. Another benefit of adding workshops into future interventions is the fact that some aspects of sustainability literacy are very difficult to learn experientially (Lugg, 2007). Take for example, the definition of Sustainability. Student understanding of the definition of Sustainability was one of two areas that decreased when looking at tallies. Learning a definition in an experiential manner is difficult, the definition is a set piece of knowledge that is not up for interpretation. The definition of Sustainability was only introduced at the beginning of the two days at school prior to embarking on camp. This was not enough exposure for students to raise their understanding of the definition. It is as simple as exposing people to the outdoors and them automatically adopting an ethic of care for the environment (Lugg, 2007).

Findings showed that the majority of individual students (10 out of 13) within the cohort improved their sustainability literacy across all areas (by an average of 2.5) and 3 students had slightly less (all with a value of -2) sustainability literacy after the intervention. The three students who did not improve their sustainability literacy already had a high level of prior knowledge and therefore little room to improve. The implication of these findings are that the intervention did, as a whole, raise students' sustainability literacy. Therefore, the methodology used for the intervention can be used as a template for improving sustainability literacy in the future. This will be useful in my own practice and the practice of other teachers looking for a template to implement EfS. I would recommend that any researchers/educators looking to implement my methodology should first read through this discussion as there are many improvements that can be made to the intervention.

The camp culture itself was conducive to improving sustainability literacy. Living communally fostered tolerance and acceptance of others at a micro-level, which potentially expanded to the macro-level as students showed improved sustainability literacy in this regard (Cook & Cutting, 2014; Lugg, 2007). Students had to work together and be more considerate and respectful of one another as they were held accountable by the group if they were not. This is an aspect missing from most schools, anti-social behaviour tends to slip through the cracks and students are able to take advantage of the inconsistencies (Reinke & Herman, 2002). The implication here is that the subliminal role-modelling of Sustainable practices inherent in communal living can bring about change in sustainability literacy (Cook & Cutting, 2014). Therefore, an aspect of communal living or adoption of the principles within communal living is recommended as a possibility for future interventions with the goal of raising sustainability literacy.

Students were given the opportunity to discuss the issue of mining in Karangahake with several stakeholders. Comments revealed that students found this aspect of the camp useful in improving their knowledge of the issue and their ability to empathise with different points of view. This aspect of the camp therefore helped to improve sustainability literacy. Stakeholder interviews were recognized by students as being instrumental in their understanding of the issue and their ability to relate to different perspectives. Several other studies have found stakeholder interviews to be influential in raising sustainability literacy (Brundiers, Wiek & Redman, 2010; Domask, 2007; O'Brien & Sarkis, 2014). Hence, stakeholder interviews specific to the intervention are recommended for future efforts to raise sustainability literacy.

5.4 Contribution to Student Achievement

What is the contribution of an issues based, outdoor camp based on EfS and PRE principles to student achievement?

Student achievement is highly variable amongst adolescents. As a teacher I have met many students who have the ability but struggle to reach their potential for a multitude of reasons. This intervention (the 10-day camp) provided an alternative way of learning that prioritised deep learning within an issue relevant to students' lives. Achievement was separated into two sections within the findings – self-reported knowledge development and NCEA achievement. These two sections are

inextricably linked, as to gain knowledge is an achievement within itself and without the right knowledge it is very difficult to gain NCEA achievement (Hume & Coll, 2010; Moeed, 2010). Within this section the student achievement findings are summarised, then discussed in terms of their implications and recommendations. Finally, the findings are compared with analogous research to extricate the similarities and differences.

Findings showed that all students improved their self-reported knowledge of mining and water quality by an average of 4.7 points out of a potential 19 points (4 questions with 5 scale points). This is a pronounced increase in knowledge which is much higher than the increase seen in sustainability literacy (an average of 2.5 points increase). There are several potential reasons for this increase in knowledge. Firstly, students had very little self-reported prior knowledge of mining/water quality (meaning that they had room to improve) and the focus of the camp was on the issue of mining and water quality. Consequently, there was more explicit teaching and learning around these two areas than there was for sustainability literacy. Sustainability literacy was mostly taught through role modelling as a way of being/behaving/viewing the world, whereas knowledge of mining/water quality was taught in workshops so that students could acquire the knowledge needed to understand the issue comprehensively (and pass the assessments). The implication here is that the time taken to teach the knowledge required for students to pass the assessment took away from the development of sustainability literacy. The recommendation here is that future EfS courses of 10 days should have an equal balance of EfS and subject specific standards (preferably one of each, rather than the two subject specific standards in my intervention) so that more time is able to be directed towards the development of sustainability literacy. Perhaps it would have been beneficial to improving sustainability literacy if EfS standards were available at Level 1 of the Curriculum, therefore allowing them to be included within the intervention.

Succeeding in the two NCEA achievement standards was likely more important to students than cultivating their personal sustainability literacy. Consequently, the students on this intervention potentially placed more importance and therefore committed more energy towards what was being assessed. This is a common effect - when assessment is included – students change their behaviour (Gibbs, 2006, p.

23). This ‘magnetism’ of assessment was foreseen which is why this study treated NCEA achievement as a by-product of the learning – not the goal. Despite this focus, students could not be expected to be ignorant to the fact that there was an assessment involved simply because the focus was placed on the daily experience rather than the end goal of credits. Including an assessment component will always affect the nature of the student experience. As mentioned previously, for sustainability literacy to be valued above credits it should be assessed on future camps. The most feasible practical recommendation then is that an EfS achievement standard should be taught in conjunction with subject specific standards on future interventions so that students value sustainability literacy equally - as recommended by Cosgriff and Gillespie (2011).

Students who stood out as being highly engaged on camp tended to increase their self-reported knowledge the most. These students also went on to gain the highest marks in the two NCEA achievement standards. This implies that Engagement and Enjoyment are precursors to increased knowledge and increased NCEA achievement. The recommendation arising from this is that Engagement and Enjoyment need to be planned for by teachers, with as much, if not more, emphasis as planning for assessment criteria. This is a pedagogical shift that has been recommended by several studies (Bobis, Way, Anderson & Martin, 2016; Ritter, 2009)

Student grades in the NCEA standards on the intervention were far above the national average. Interestingly, student grades on the intervention were identical to the students’ grade average in a previous science achievement standard. In this respect the camp showed no effect on the NCEA achievement level of this contingent of students. On a positive note, student comments revealed that their experience of learning on this intervention was far superior compared to the learning at school that they had previously experienced. The key benefit of the camp therefore, lies in the student experience, deep learning and the development of sustainability literacy, not improved academic achievement. The fact that student achievement did not increase from the camp contradicts literature that extolls the academic improvements that can be made from a similar methodology (Fägerstam & Blom 2013; Rios & Brewer, 2014). Regardless, there is evidence to support my findings – similar studies have found that student achievement did not radically

increase following a Sustainability intervention, but the experience was more meaningful for students and involved deeper learning (Mellvig & Nilsson, 2015).

To have gained the same level of achievement as school based achievement standards is not a poor reflection on the intervention. On the contrary, it is very encouraging for the methodology employed. Students retained the same level of achievement despite living in a challenging environment, working at twice the rate they would at school, learning completely new content (much of what is taught in Y11 is simply a regurgitation of the content in Y9 & 10), learning about sustainability literacy and learning how to operate in a communal environment. When compared in isolation the two achievements are equal. When compared as a whole experience, the achievements are vastly different and the intervention experience is arguably much richer.

5.5 Conclusions, overall implications & recommendations

Findings showed that certain aspects of the intervention had positive effects on student experience, improved achievement and acquisition of knowledge, and developed sustainability literacy. The positive effects of these aspects were determined from the 'ground up', in other words – they came from student responses to questionnaires, focus group interviews and participant observations. This was intentional, as to stay true to the roots of EfS, Outdoor Learning, IBE and PRE it was important that student voice was paramount in determining the 'success' of the intervention. A huge part of these theoretical frameworks is fostering democracy and empowering students, which cannot be done without including them in the design, implementation and evaluation of any intervention. In fact, even the notion of 'empowering' students' implies that they have no power – which unfortunately is the case in mainstream education in New Zealand. Taking student voice into account, the aspects identified by students as being the most influential in improving the experience, allowing for achievement and acquisition of knowledge, and developing sustainability literacy were:

- Co-construction of the course of learning and daily activities.
- Contextualised learning in a local setting, with a focus on an issue that students felt that they could make a difference to.

- Having an acclimatisation period as part of the camp, where students could get used to the setting, each other, and cultivate an ethic of care for the place itself.
- Social, flexible learning where students were trusted and given ownership over their own actions.
- A camp of 5-7 days' length to allow for the 'culture' of the camp to exist.
- Educators as facilitators who are approachable and part of student daily lives.
- Linked assessments to reduce student workload and increase cognitive links between different aspects of a complex issue.
- Living communally fostered personal responsibility and allowed for students to learn personal and interpersonal skills.
- Having guest speakers or 'stakeholder interviews' allowed students to interact directly with the community and understand the 'issue' on a much deeper level by providing an opportunity for dialogue and multiple points of view.

Of course, these 'successful' aspects are individual to this intervention, and many of the ideas within (such as co-construction) are not new. However, participating in this action research intervention has proven to be immensely useful for me in identifying the aspects that were appreciated by students because it informs my own practice. It cannot be determined whether these 'successful' aspects were identified in spite of other aspects or because of them – I have no mechanism to identify how the different ideas supported each other. Consequently, I recommend that other aspects of the methodology are not discarded at the expense of the factors identified by the students as being the most important (many of the ideas are essential to the framework of EfS, Outdoor Learning, IBE and PRE). The fact that the 'successful' aspects were from the theory of EfS, Outdoor Learning, IBE and PRE is very promising. Essentially it means that the four theories not only have a lot in common, but that they can work together to form a cohesive intervention. To me it makes little sense to divide these theories into separate categories when they have so much in common and evidently work so well together. A key idea in EfS is acting as an 'umbrella' for other theories to fall under (Kopnina, 2014). I would, therefore, suggest that EfS intersects with the other three theories in order to make the most out of the numerous links between each theory. There is strength in diversity – but

it does seem to be somewhat of a waste for each area of research to be isolated when there is more benefit (for student outcomes) in integrating them.

There were some aspects of the camp that can be improved upon – students did not have a lot of individual choice on the issue that we decided on as a class, certain aspects of sustainability literacy showed little improvement and many students did not gain a holistic understanding of either 'Sustainability', 'Place' or 'Environment'. In order to remedy these aspects I will implement the following improvements in my own practice (the design of a year-long EfS programme) and would strongly recommend that practitioners utilising my methodology as a template take note of these improvements:

- Contextual issues chosen in groups of 3-4 will lead to more flexibility in choosing an issue to concentrate on whilst retaining social learning and communal responsibility.
- Introductory/discovery camps at the start of the year will form strong interpersonal relationships whilst allowing students the chance to decide on an issue based upon their own experience.
- Repeated visits to same environment within the year will foster a stronger sense of place and allow students to physically explore issues from different perspectives as they explore the topic.
- A stronger involvement with the local community, particularly cultural leaders will maintain a balance of different aspects of Sustainability, thereby allowing students the opportunity to gain a more holistic understanding of Sustainability.
- Establish prior knowledge of sustainability literacy and use it to inform pedagogy in order for individual learning needs to be met.
- Emphasise the aspects of sustainability literacy that are lacking across the contingent via workshops to foster a more holistic understanding of Sustainability.
- Ensure that an EfS standard is always included when other standards are in order to balance student focus and put more emphasis on the importance of sustainability literacy.

There are significant hurdles to be navigated in implementing a year-long EfS programme within the current school structure, prominent among these are administrative support and funding. An EfS programme requires field trips in order to stay true to best practice and provide the best possible student outcomes. Field trips are expensive. It is illegal to charge students for any curriculum related activities they choose to take in the public school system because it excludes lower income families. Schools can ask for donations but students cannot be excluded if these donations are not obtained (Ministry of Education, 2013). Funding must be found somewhere, to extract it from the community itself through activities such as car washes is not only time consuming – it drains from the local economy. My suggestion and current direction is to find corporate funding for the EfS course – this represents somewhat of an ethical dilemma in providing a corporate influence to students, however, if done in an ethical way I believe that it provides the most reasonable solution. This will require careful vetting of sponsors and limits placed on their access to students and influence on the programme.

Another hurdle for EfS is administrative support. An EfS programme cannot exist without a passionate teacher, who is backed by a forward thinking senior management and board. For EfS to be implemented to its full potential, it needs to be at a whole-school level, which takes considerable time and effort (Eames & Cowie, 2004). The other aspect of administrative support that is currently lacking is a funded support network for EfS teachers. Being the only teacher of EfS standards in a New Zealand secondary school presents its own set of hurdles – it is necessary to find mentors and moderators for student work and these are currently in short supply.

The most worrying finding of this study is the low amount of confidence that students had in democracy. The students lacked knowledge about how to participate in democracy and indicated a lack of trust in democratic institutions: they do not believe that they will work in their best interests (or even acknowledge their opinions). I believe it is important to acknowledge this point, as it is something that I myself have noted within the schooling environment and in society at large. Young people generally get treated very condescendingly. Perhaps with more opportunity to develop their action competence through EfS, their confidence in active democracy will increase and society at large will begin to treat these students

as equal participators in democracy. Participatory democracy is on the decline and without fostering it within students we will end up with a very disenfranchised population in New Zealand.

The implications and recommendations from my research led me to consider potential future avenues for research. One suggestion is that further research in the field of EfS focusses on implementing the framework in the methodology of this study (with improvements) in an urban environment to see if the benefits can be replicated in a diverse range of environments. Furthermore, implementing the framework of this study in developing countries could potentially be the most effective effort to raise global sustainability and it would be interesting to see whether a strong ethic of care can be developed under the weight of poverty.

On the same theme, it would be intriguing to investigate how socio-economic conditions affect the development of sustainability literacy in New Zealand and abroad (Payne, 2015, p. 366). It could also be worthwhile pursuing further study into the effect of communal living on sustainability literacy, given the positive outcomes witnessed from community in this intervention. A longitudinal study of students involved in EfS courses would be useful to track the influence of EfS on sustainability literacy and action competence later in life.

The most effective strategy for improving sustainability literacy appears to be for schools to adopt the 'whole school approach' – more research into the process of transitioning to an EfS based school and the outcomes of doing so would be very useful. To do so could provide evidence and a path for schools to adopt the 'whole school' approach with confidence. This in turn could raise the enjoyment and engagement of students, providing them with the tools to be an active democratic citizen.

My strongest (and most radical) recommendation is for a critical examination and upheaval of the organisational structure of schools in New Zealand. We operate from an outdated hierarchical model that robs both students and teachers of creativity, power, time and information. This results in the frustration, disempowerment and disengagement of both students and teachers. To use a gardening metaphor: think of EfS as a plant with great potential, and the current

organisational structure as old, depleted soil that cannot support new life. The soil needs to be turned over. It needs to be made fertile. Without doing so I believe that EfS and every other idea of merit will come up against the wall of administration and institutional thinking. A fertile organisation would value all people (staff and students) equally, share information transparently, trust people equally, be flexible to change and share power so that people do not need to be 'empowered' – they already have power. Researching organizations that allow for the implementation of EfS is my next avenue of study as I believe that it will have the greatest impact on student wellbeing – much more so than trying to implement EfS in the face of so much institutional resistance.

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Appendix A

Sustainability Survey Questions (20mins)

Section 1: Semantic differentials (displaying polar opposite viewpoints and a sliding scale between them).

Student instructions: Each question in this survey requires you to choose where you stand on a certain topic. You are faced with 2 opposite viewpoints and simply have to circle where you sit on the scale. Choosing the middle of the scale represents being unsure, being neutral or not knowing enough about the topic. The closer you choose towards a statement, the stronger you feel that the statement is true. Just circle the number that fits best with your thoughts.

Questions

a	It is ok to use something once and throw it away.	**1 2 3 4 5**	People should buy/make products that can be reused again and again.
b	I have not put any thought into how we can make society more sustainable.	**1 2 3 4 5**	I think quite a lot about possibilities for making society more sustainable.
c	I have never thought about how different people might value the environment for different reasons.	**1 2 3 4 5**	I understand that the culture/background of different people means that they may value the environment differently.
d	When faced with a tough choice, I usually just go with whatever is easiest.	**1 2 3 4 5**	When faced with a tough choice I try to think to myself – what is the right thing to do? Will my actions be helpful or harmful?
e	I believe that I can make a difference in the world by taking action on sustainability issues.	**1 2 3 4 5**	Any action I take for a sustainable future will not make any difference.
f	I believe that getting involved in decision-making (e.g. voting, protesting for what you believe in) is everyone's responsibility.	**1 2 3 4 5**	I believe that authorities (e.g. governments, councils) know best and should make decisions for me
g	I can discuss multiple ways that a waterway can become unhealthy	**1 2 3 4 5**	I have no idea how land use can make a waterway unhealthy for living things.

	for living things based on the surrounding land uses.		
h	I can suggest multiple ways to clean up a waterway that is unhealthy for living things.	**1 2 3 4 5**	I have no idea how to clean up a waterway that is unhealthy for living things.
i	I understand why we have mines	**1 2 3 4 5**	I do not understand why we have mines
j	I think that there are more pros than cons to mining.	**1 2 3 4 5**	I think that there are more cons than pros to mining.
k	I can discuss how mining affects living and non-living things	**1 2 3 4 5**	I am not sure what the effects of mining are
l	I think that everyone's opinion matters.	**1 2 3 4 5**	I think that some people's opinions matter more than others.
m	I can recognize the difference between the symptom of a problem and the cause of a problem.	**1 2 3 4 5**	I am unsure what the difference is between a symptom and a cause.
n	I think that sustainability is about preserving our environment.	**1 2 3 4 5**	I think that sustainability is about balancing the needs of our environment with the needs of our society, cultures, and economy.
o	I think that the needs and wants of humans are more important than the needs and wants of other living things.	**1 2 3 4 5**	I think that the needs and wants of all living things are equal.
p	I think that the human race/ Planet Earth is doomed, so we may as well do whatever we want – it doesn't matter.	**1 2 3 4 5**	I think that if we make smarter decisions as a species we can make the world a better place to live in.
q	I think that the Maori people of New Zealand have the rights to New Zealand's freshwater rivers, lakes and streams.	**1 2 3 4 5**	I think that the government of New Zealand should control the rights to New Zealand's freshwater rivers, lakes and streams.

r	I think that economic development should take priority over environmental protection.	**1 2 3 4 5**	I think that environmental protection should take priority over economic development.
s	I will eat less meat because it reduces worldwide pollution and helps to stop global warming.	**1 2 3 4 5**	I will not eat less meat even though I know that I am contributing to greenhouse gases and pollution.

Appendix B

Focus Group talking points

1. What are 3 things that you enjoyed on camp?
2. What is the one thing you would do to improve the camp?
3. Do you think that spending time in the around Karangahake has made you appreciate the area more? Why/ Why not?
4. Do you think that spending time learning how to be safe within the environment (eg. River crossing skills) allowed you to feel more comfortable within the environment? Why/ Why not?

5. Do you think that you have a good understanding of how different factors in the stream show how healthy the stream is?

6. Do you think that learning through focusing on the real life issue of mining makes the learning more or less interesting.

7. Did you find learning outdoors more or less fun than learning the same content in the classroom? Why/why not?

8. Do you think that investigating water quality helped you to make a decision on whether mining was a good idea? Why/ Why not?

9. Did interviewing people influence your thinking on whether mining in Karangahake was good or not? Who was the most influential and why?

10. Did visiting the Martha mine site influence your thinking about whether mining in Karangahake is good or not? What in particular influenced your thinking?

11. If you encountered a sustainability issue (like mining) that really meant something to you, do you feel confident that you could do something about it?

12. How would you go about it?

13. What might stand in your way to being successful?

Appendix C

Achievement Standard 90925

Subject Reference		Biology 1.1			
Title		Carry out a practical investigation in a biological context, with direction			
Level	1	**Credits**	4	**Assessment**	Internal
Subfield	Science				
Domain	Biology				
Status	Registered	**Status date**	30 November 2010		
Planned review date	31 December 2019	**Date version published**	20 November 2014		

This achievement standard involves demonstrating investigation skills by collecting, processing, and interpreting primary data in a biological context, with direction.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Carry out a practical investigation in a biological context, with direction.	• Carry out an in-depth practical investigation in a biological context, with direction.	• Carry out a comprehensive practical investigation in a biological context, with direction.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum*, Learning Media, Ministry of Education, 2007, Level 6. It is aligned with the Nature of Science and Investigating in Science strands, and is related to the material in the *Teaching and Learning Guide for Biology*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

This standard is also derived from Te Marautanga o Aotearoa. For details of Te Marautanga o Aotearoa achievement objectives to which this standard relates, see the Papa Whakaako.

2 The procedures outlined in *Safety and Science: A Guidance Manual for New Zealand Schools*, Learning Media, Ministry of Education, 2000, must be followed during the practical investigation. Investigations must comply with the Animal Welfare Act 1999, as outlined in *Caring for Animals: A Guide for Teachers, Early Childhood Educators, and Students,* Learning Media, Ministry of Education, 1999.

3 The primary data being collected may come from field work, laboratory practical work, or from the use of models.

4 *With direction* means that general instructions for the investigation will be specified in writing and direction will be given in the form of a purpose, an outline of the method, and the equipment and/or organisms from which to choose. A template or suitable format for planning the investigation will be provided for the student to use.

5 *A practical investigation in a biological context* includes: making accurate measurements, recording primary data, appropriate processing of the data (eg calculations, tabulating, graphing), techniques relevant to the biology context (eg culturing micro-organisms, use of a microscope, quadrat sampling), identification and control of variables, interpretation of processed data, relating findings to the purpose to reach a conclusion.

6 *Carry out a practical investigation in a biological context* involves:

- developing a method with sequential steps for collecting data. The collection method will include:
  - identification of the range of the independent variable or the sample (at least three values)
  - measurement of the dependent variable (or the collection of field data) with units
- collecting, recording and processing primary data relevant to the purpose. The raw data must be within a range of values feasible for the context.
- reaching a conclusion based on interpretation of the processed data.

7 *Carry out an in-depth practical investigation in a biological context* involves:

- a statement of purpose written as a hypothesis
- a method that includes: a valid range for the independent variable (or sample); a description of, and where possible control of, other significant variables that may affect the results; accurate measurement of the dependent variable (or collection of field data) with units and consideration of factors such as sampling bias, and/or sources of error
- a method of collecting, recording and processing data that enables a trend or pattern (or its absence) to be determined
- a valid conclusion based on interpretation of the processed data that links to the purpose of the investigation.

8 *Carry out a comprehensive practical investigation in a biological context* involves justifying the choices made during the in-depth investigation, i.e. evaluating the validity of the method or reliability of the data and explaining the conclusion in terms of applicable biological ideas.

9 Conditions of Assessment related to this achievement standard can be found at http://ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards.

Replacement Information
This achievement standard replaced AS90161.

Quality Assurance

1 Providers and Industry Training Organisations must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.

2 Organisations with consent to assess and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Achievement Standard 90951

Subject Reference	Science 1.12				
Title	Investigate the biological impact of an event on a New Zealand ecosystem				
Level	1	**Credits**	4	**Assessment**	Internal
Subfield	Science				
Domain	Science - Core				
Status	Registered	**Status date**	30 November 2010		
Planned review date	31 December 2019	**Date version published**	20 November 2014		

This achievement standard involves investigating the biological impact of an event on a New Zealand ecosystem.

Achievement Criteria

Achievement	Achievement with Merit	Achievement with Excellence
• Investigate the biological impact of an event on a New Zealand ecosystem.	• Investigate, in depth, the biological impact of an event on a New Zealand ecosystem.	• Investigate, comprehensively, the biological impact of an event on a New Zealand ecosystem.

Explanatory Notes

1 This achievement standard is derived from *The New Zealand Curriculum,* Learning Media, Ministry of Education, 2007, Level 6. It is aligned with the Ecology achievement objective in the Living World strand, and is related to the material in the *Teaching and Learning Guide for Science*, Ministry of Education, 2010 at http://seniorsecondary.tki.org.nz.

This standard is also derived from Te Marautanga o Aotearoa. For details of Te Marautanga o Aotearoa achievement objectives to which this standard relates, see the Papa Whakaako.

2 This investigation involves collecting information about the biological impact of an event on a New Zealand ecosystem. The information could come from a variety of sources such as direct observations, collection of experimental data, resource sheets, photos, videos, websites, and reference texts.

The procedures outlined in *Safety and Science: A Guidance Manual for New Zealand Schools*, Learning Media, Ministry of Education, 2000, must be followed during any practical component investigation.

3 *Investigate* involves describing observations or findings, using those findings to identify changed environmental factors, and describing how the changed environmental factors might affect organisms within the ecosystem.

4 *Investigate in depth* involves using findings and biological ideas to make causal links between changed environmental factors and the ecological characteristic or

process to explain the impact on organisms or implications for the ecosystem as a whole.

5 *Investigate comprehensively* involves using findings and biological ideas to make significant causal links between changed environmental factors and the ecological characteristic or process to discuss:

- the impact on the organisms, and
- the implications for the ecosystem as a whole.

It may involve explaining, elaborating, applying, justifying, relating, evaluating, comparing and contrasting, and analysing.

6 *An event* may include natural events such as floods, drought, seasonal changes, landslides and fire; or human actions such as pest control, application of fertilisers, trampling, urbanisation, or pollution.

7 Environmental factors about which information is collected may include: moisture levels, light intensity, temperature, stream clarity, food availability, competition, predation, wave and wind action, shelter, and oxygen levels.

8 Ecological characteristics and processes may include: food chains/webs, variety of organisms (diversity), nutrient cycles, water cycle, energy flow, interrelationships (predation, parasitism, mutualism), density, distribution pattern, and key species.

9 Conditions of Assessment related to this achievement standard can be found at http://ncea.tki.org.nz/Resources-for-Internally-Assessed-Achievement-Standards.

Quality Assurance

3 Providers and Industry Training Organisations must have been granted consent to assess by NZQA before they can register credits from assessment against achievement standards.

4 Organisations with consent to assess and Industry Training Organisations assessing against achievement standards must engage with the moderation system that applies to those achievement standards.

Consent and Moderation Requirements (CMR) reference 0233

Appendix D

Informed Consent Forms

**Please read this form to/with your child.*

Dear Parent/Caregiver

Your son/daughter has chosen to attend the Karangahake Sustainability Camp over a period of seven days.
What the camp is about:
The camp is the culmination of several years' research into improving student experiences and outcomes on camp. All aspects of the camp have been developed in consultation with the students, including the selection of the camp itself (Dickies flat) and the skills that they would like to learn. This camp is different in that it has a learning aspect, students will be completing 2 NCEA Level 1 Achievement standards on camp (one from Physical Education and one from Science). Learning will be centered around the context of sustainability in the local area – with the controversial mining that is taking place as a key focus. The learning method deals with real world problems in a hands on manner. Your son/daughter's participation in the study aspect of the camp is entirely voluntary and their/your decision to participate or not will not affect their participation in the camp in any way. Your son/daughter will also have the right to withdraw from the research aspect at any point prior to or during the camp, without repercussions.

What the research project is about:
The camp is the research component of my Masters of Education degree through the University of Waikato. I am interested in developing sustainability literacy in students, which is the ability to recognize/investigate what is and is not sustainable – and how to take action that leads to a sustainable outcome. All aspects of the camp are designed with the goal of increasing sustainability literacy in mind. In order to check if my method of developing sustainability literacy is effective, I need to examine the impact of the camp on students. To do so, I am required to gather information from the students on the camp.

What being involved means for the student:
Students who consent to be involved in the research aspect of the camp will be asked to complete an identical 20 minute pre- and post-camp survey whilst on camp and a short (20-30 min) focus group interview in groups of 4-5 students. The survey and interview will consist of questions designed to assess the students' current understanding of sustainability and their opinion on a range of sustainability issues. I will also be observing and making notes about the students' learning during activities on camp.

What happens with the research data:
To ensure confidentiality and anonymity, any student participating in the study aspect can choose their own pseudonym (fake name) which will be used when reporting anything they said or did in the data, so that it reduces the likelihood that anyone reading the data will identify who provided that data. The data itself will not be available for public viewing and will be secured on my password protected hard drive. My Masters thesis and any subsequent publications will not mention the name of the school or the participants. The data is solely used to measure the impact of the camp on student learning and experience, it cannot be used to reflect on the students, school, or community. Students and caregivers have the opportunity to view their own/child's data at any point, and the conclusions of the data upon completion of the thesis.

Consent:
I would appreciate your, and your child's, consent to participate in the study as part of the camp they have chosen to attend; you can indicate that consent by completing the

attached form and returning it to me at school. Should you have any more questions about the research, please email me at benw@mmc.school.nz. You may also contact my study supervisor, Dr Chris Eames (c.eames@waikato.ac.nz, 07 838 4357) at any time if you have concerns or questions.

Kind Regards,

Ben Wood.

Research Consent Form

I have read the attached letter of information.

I understand that:

1. My/my child's participation in the project is voluntary.

2. I/my child have/has the right to withdraw from the research study up until the end of the camp (this does not mean that you/they have to withdraw from the camp, just that you/they would not like to have your/their voice included in the survey and interview).

3. Data may be collected from me/my child in the ways specified in the accompanying letter. This data will be kept confidential and securely stored.

4. Data obtained from me/my child during the research project may be used in the writing of a thesis, reports or published papers and making presentations about the project. This data will be reported without use of my/my child's name.

I can direct any questions to Mr Ben Wood [email: benw@mmc.school.nz Tel: 0226773283].

For any unresolved issues I can contact the Project Supervisor.
[Chris Eames at c.eames@waikato.ac.nz].

I give consent to be involved in the project under the conditions set out above.

Name (Student):_____

Signed (Student):_____

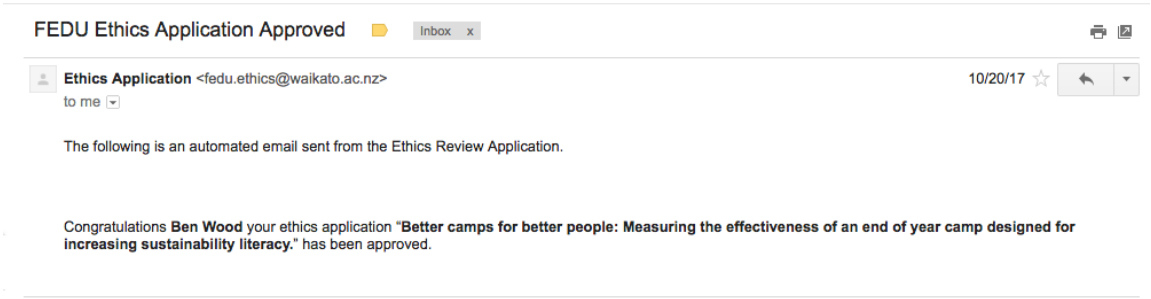
Name (Parent/Caregiver):_____

Signed (Parent/Caregiver):_____

Date:_____

Please return this form to Mr. Ben Wood at school.

Appendix E



FEDU Ethics Application Approved Inbox x

Ethics Application <fedu.ethics@waikato.ac.nz> 10/20/17

to me

The following is an automated email sent from the Ethics Review Application.

Congratulations **Ben Wood** your ethics application "**Better camps for better people: Measuring the effectiveness of an end of year camp designed for increasing sustainability literacy.**" has been approved.